JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. C., No. 2322.—TUESDAY, NOVEMBER 12, 1907.

EDITORIAL NOTES—GAS, &c.

Steam-Rollers and Gas Distribution Systems.

THE importance of the case which came before His Honour Judge Williams and a Jury at the Shoreditch County Court yesterday week, in which the Gaslight and Coke Company were mulct in damages for the effects of gas poisoning resulting from an escape of gas from a broken main, must not be appraised by the facts that the case was tried in a County Court and that the amount of damages was small. Several weighty issues are involved in the case; and we feel that the Gaslight and Coke Company, while fully sympathizing with the poor people who have suffered, will not be disposed to leave the matter where it is. The Company single-handed did battle with Metropolitan Authorities, in 1885 and 1887, over the question of liability for damage occasioned by the use of these heavy road-repairing machines, and then established the responsibility of all local authorities. The gas undertakings of the whole country have been the debtors for twenty and more years to the Company for what they then did. Despite the decisions of the High Court, however, the Company have now been held accountable for certain results of an injury wrought by a 10-ton steam road-roller to what the evidence shows was a good pipe, well and truly laid. We say with confidence "a good pipe, well and truly laid," because we are sure the Directors of the Company would be the last to attempt to defend, and their Chief Distributing Engineer (Mr. G. F. L. Foulger) would be the last to advise them to do so, any case where there was any suspicion that the fault for the damage was not wholly and solely attributable to the steam-roller. In these disputed cases of steam-roller damage, it is essential that gas companies should be very sure of their ground, in order that awkward precedents may not be created, and that the High Court decisions of 1885 and 1887 may not, in any way, be affected. In the Shoreditch County Court, the decisions of the High Court—decisions which placed the onus for resulting damage upon local authorities using steam-rollers—are apparently not regarded as being either binding or serving as trustworthy guides.

The general facts surrounding what is known as the Hoxton gas-poisoning case need not be dwelt upon here, further than to say that there appears to have been contributory negligence on the part of some one or more persons in not having apprised the Company earlier of the leakage of gas. During the afternoon preceding the regrettable event, there was a smell of gas; but no one—such is human indifference—seems to have realized that it was his or her business to communicate with the Company's officials. It was not until the next morning—after one woman had lost her life, and others were suffering the effects of gas poisoning—that the Company were cognizant of either the work of the steam-roller in the street in question or of the escape of gas; but when the officials were informed of what had occurred, within a few minutes representatives of the Company were on the spot. Here we may leave the general facts (the escape from a broken main and the poisoning being admitted), and address ourselves principally to two important matters raised in the case—the questions of subsidence and main inspection—around which the proceedings at the hearing largely revolved. The absence of main inspection was counted an act of negligence on the part of the Company, that "negligence" allowed a supposititious subsidence under the main, and fracture ensued on the running of the steam-roller; and therefore the assumption of the Company's liability to damage. Impracticability and assumption stood for more in this case than the judgments of learned Judges in the High Court.

Let us now examine the facts bearing on the points being treated upon here. The broken 3-inch pipe was produced in Court. It was manifest to all capable of judging that it was a good pipe; the fracture straight through the pipe was clean and bright, and was indicative of a steam-roller break. The soil in which the pipe was bedded must have been exceedingly good, for the pipe is in excellent condition, although it has been doing service for forty years in the same position, having been laid by the long defunct Independent Gas Company. The break was at the spigot end of the pipe, about 6 inches from the socket. The position of the pipe in the socket and the breaking of the continuous contact of the pipe with the jointing material at the bottom and the compression of the material at the top, were evidences of the joint at the time of the accident being under compression at the top and in tension at the bottom. The breakage was undoubtedly the result of violence due to some abnormal circumstance, into which we will inquire presently. It was alleged that the main could not have originally been securely laid in proper soil, or the accident would not have happened. To practical men, the absurdity of the contention is really entirely disposed of by the fact that the pipe has an admitted service record of forty years, and that it has previously met with no misadventure. It was declared by a couple of witnesses, and the declaration was laboured for all it was worth, that on their way to work in the morning they saw a "boat-shaped hollow underneath the "pipe." Supposing they did, what has that to do with the Gas Company? Besides, they and learned Counsel who appeared for the claimants were not sufficiently well versed in the physical properties of cast-iron pipes to know that such pipes will not bend, and that it does not require a considerable hollow beneath such a pipe to cause it to snap under certain unusual conditions. How the men, too, could have seen a boat-shaped hollow under and longwise of the pipe, so early in the morning, before the pipe had been cut out, is incomprehensible; and a complete denial of their evidence was given by Mr. Foulger's Chief Assistant (Mr. Reeson), who was positive that there was no such hollow under the pipe. But assuming there was a subsidence under the pipe after its forty years' occupation of the soil, the Company are completely exonerated from any ill-results arising from it by the decision of Mr. Justice Stephen in the St. George's, Hanover Square, case in 1887. His Lordship then said: "I think that so long as the Gas Company began by laying "their pipes in a proper manner, any misfortunes in the "way of subsidence which may arise from causes with "which neither the Company nor the Vestry have anything "to do, do not justify the Vestry in breaking the pipes." In the same case Mr. Justice Charles was clearly of opinion that the Company were not bound to guard against subsidences which were not of their own creation; but that the local authority, in using their steam-rollers, must take the risk of any such subsidence. What greater proof can be wanted in this Hoxton case of an original proper laying of the pipe than the nearly forty years' service?

Further, it was alleged against the Company that they were negligent in not having thoroughly inspected the pipes since they were laid some forty years ago. No one but a dreamer or an unpractical individual would suggest the inspection of the vast canalization of the Gaslight and Coke Company for the purpose of ascertaining whether there are any cavities under them, which might or might not be the seat of damage in the event of a steam-roller passing over the spots where the cavities existed. In the first place, the cited cases fix the responsibility for damage; and, in the second place, as Mr. Foulger pointed out in his evidence, the work of laying bare the mains to ascertain whether there were any hollows under them would be the best possible means of creating such hollows under the pipes all over London. For an average depth of about 15 feet over the greater part of London, the ground is "made up" over the original marsh level; and made-ground of this description is better left to consolidate itself by age, and not be loosened by periodical opening up. The impracticability of the suggestion, too, is made manifest by the one fact that in busy London streets, the Company have some 2000 miles of

pipes; and periodical inspections would be such a nuisance, and cause such a dislocation of traffic, that the public would not tolerate it. With the responsibility fixed upon them by the cases of 1885 and 1887, the local authorities, too, would naturally and properly object to Gas Companies making these inspections, and so disturbing the bedding of the pipes, which could only result in increasing the danger from subsidence, and consequently the responsibility of the local authorities. But, after all, this is the first fatal accident, to the best of our recollection, that has occurred in London through escaping gas caused by the fracture of a pipe by a steam-roller.

There is one further interesting point about the case, and that is the theory that Mr. Foulger submitted as to how the pipe became broken. He has said before, and he has said again now, that he does not fear for the safety of his distribution system by the peregrinations of steam-rollers when the supporting crust of the roadways is undisturbed; it is when the crust is broken up for repair or renewal that danger does arise. In this case, the pipe broken was 9 feet long; and half of it was under granite setts and the other half under the macadam road that was being rolled. It was the part under the granite setts that was broken. The portion being rolled had been specially watered for the purpose of consolidating the newly added macadam; and this would naturally give, by the weight of the steam-roller, in a way the granite setts would not possibly do. In order to roll the surface quite up to the granite setts, the roller had to mount the later; and it seems feasible that the roller, at the point where it left the granite setts, would give an impact blow to the soil, the force of which would be communicated to the pipe lying 23 inches below. Mr. Foulger's theory seems the only feasible one.

It was suggested in the course of the hearing that the Company should be represented at all scenes of steam-roller operations. The local authorities, however, might think such representation a piece of impertinence on the part of gas companies, in view of the risks attaching to the employment of steam-rollers being imposed on the users; and, furthermore, the proposal is one that should not be lightly entertained by gas companies, without ascertaining whether representation would in any way affect the position of the question of legal responsibility. Everywhere gas companies desire to do all possible to safeguard the public; but they cannot do anything to jeopardize their own legal protection and absolution from responsibility for damage. Any suggestions, however, that the local authorities might make in this matter would, we are certain, be courteously received by gas companies, and accorded serious consideration.

Imperial Continental Gas Association—
An Experience in Vertical Retort Working.

Increased profits, an increased consumption of gas, and increased connection of ordinary and prepayment meters, constitute part of the common tale that the Directors of the Imperial Continental Gas Association have to tell the proprietors half-yearly in their reports, and upon which good fortune it is the pleasure of the Chairman (Mr. J. Horsley Palmer) to have to comment when addressing the proprietors. At the meeting last week, report had also to be made of a higher price for coal, and of an improved value for coke, but a somewhat reduced value for tar and ammonia products. These are the matters that chiefly concern the investing proprietor who (not being an expert in gas matters) very properly estimates the condition of the undertaking only along the financial and business lines of progression. The manufacturing technicalities and economies have far less attraction and meaning for him. On this occasion, the Chairman devoted also a substantial part of his address to two new departures in policy; but their rank in interest is more domestic than general. For the first time in the 75 years' history of the vast undertaking, the Directors have published a general balance-sheet, instead of putting the proprietors who desired further information than has hitherto appeared in the report to the inconvenience of going to the office to inspect the accounts. The second new departure is that the French stations have now been formed into a separate Company—separate only in name and book record, but subject to the same direction (with one addition), with the same sources of capital, and the same destination for the profits, as of old. The separation is merely a political one; the ties with the Association are as close as ever they were.

These are matters from which, with this brief reference, we can turn to the consideration of that very live question both in Germany and in this country of the vertical retort system of carbonization. There was a time when the employment of the phrase in the "Journal" "the coming of the "vertical retort" was considered worthy of a little friendly banter. The vertical retort has come. In Germany, there are several installations, some of considerable magnitude; and in this last-issued report of the Imperial Continental Gas Association we read: "At Berlin, progress was made in "the erection of eight furnaces of vertical retorts at Marien-"dorf—seven having twelve retorts, each producing 14,700 "cubic feet per day, the eighth furnace being an experi-"mental one of five retorts each of nearly treble the capacity "—viz., 42,000 cubic feet per day." In view of the importance of this statement, we cannot refrain from expressing disappointment that the Chairman at the meeting dismissed the subject in rather summary fashion. The construction of these eight settings of large vertical retorts opens a new chapter in the history of coal carbonization for gas production. Nevertheless, the statement in the report, short as it is, is not barren of interest. It conveys to the gas engineer, Herr Körting's conviction—a conviction so profound that he is willing to stake his reputation upon it—that the 5-metre vertical retorts with which he has been experimenting at the small works at Oberspree have attained such success that they can, with the fullest confidence, be incorporated as part and parcel of the large and magnificent manufacturing plant being concentrated at Mariendorf. But the statement conveys something more. It is that Herr Körting is not satisfied that finality in result and economical operation have been achieved by vertical retorts of the capacity of the 5-metre ones, and so he is pursuing his investigations with retorts of larger dimensions. Carbonization in large chambers has been attracting, through the work at Munich, considerable attention in Germany, and with results that persuade one that the ultimate limits of economical carbonization have not yet been decisively marked. The seven settings of twelve vertical retorts that are under construction at Mariendorf, will have a producing power per retort of 14,700 cubic feet of gas per day, which is equivalent for the whole of the seven settings to a daily production of 1,234,800 cubic feet. This 14,700 cubic feet per retort per day is well within the productive experience with the Oberspree retorts, as we remember that with Westphalian coal Herr Körting realized an average, in several weeks' working, of 14,833 cubic feet per retort, with the admission of a small quantity of steam. Illuminating power is not mentioned; and, of course, that cannot in this country be disregarded while an illuminating power standard exists. The setting of five retorts of greater girth is expected to have a productive capacity of 210,000 cubic feet (or 42,000 cubic feet per retort), compared with 176,400 cubic feet for each setting of twelve vertical retorts. We will not anticipate what Herr Körting is hoping to gain from these larger dimensioned retorts over and above those of which he has already had experience; but we shall hope, in due season, to learn whether there are any savings in capital expenditure, space occupied, labour involved, and fuel expenditure, whether estimated gas production conforms with the actual, and whether there are any further changes to be recorded in the illuminating and calorific qualities of the gas, and in the quantities of residual products.

Several British engineers have been making a pilgrimage to the Oberspree station for the purpose of personally investigating the working there of the 5-metre verticals; and we must not suppress mention of their pleasure with what they have seen. We will not say more at present. On good authority, however, it can be said that, after a continuous nine months' run, the Oberspree retorts, under an average temperature of 1400° C. (which has had to be maintained to get the best results), have not been in any way deformed, and consequently the ease of their discharges has not been impaired.

The benefits to the gas producer from vertical retort working accumulate. The latest information from Germany attributes to the system a material reduction, in contrast with the older systems of carbonization, of bisulphide of carbon in the produced gas. The point will be of interest to the users of British coals of varied sulphur content, and to would-be users of coal interdicted for gas making solely

on account of the excessive amount of contained sulphur. Numerous comparative trials in Berlin and at Dessau, over several months, place the reduction of the grains of sulphur per 100 cubic feet of gas (through carbonization in vertical instead of horizontal or inclined retorts) at quite 50 per cent., no matter the character of the coal—whether English, Westphalian, or Silesian, or a mixture of the three. Silesian is, as a rule, by far the best of the three coals with regard to sulphur compounds, Westphalian being a bad second, and English coal is charged with being generally the worst. But the percentage sulphur-reduction results with English coal alone show as favourable as the results with the other coals, or with mixtures. The simple explanation of the smaller quantity of bisulphide of carbon in the gas produced by the vertical retorts is that far less of the compound is formed during the production of the gas than in horizontal or inclined working, owing to the bulk of the gas passing through a temperature in the retort below bright red, whereas in the case of horizontal and inclined retorts part of the gas is always exposed to a bright red temperature. To put it another way, the chief reason for the observed difference in the bisulphide of carbon is the non-existence in the vertical retort of the large superheated free space which leads in horizontal and inclined retorts to the formation of pitch, naphthalene, and carbon deposits. Confirmation of what is generally stated here is obtained by investigations over several months, which gave an average of 28 grains of sulphur per 100 cubic feet of gas with inclined retorts, and 13·30 grains with vertical retorts. The proportions of different coals used may have made some little difference in favour of the verticals in the results of the tests; but the variation in proportion would not account for the whole of the improvement. Anyway, the work on coal carbonization in vertical retorts suggests that they will extend the range of coals available to gas manufacturers, through not only this lessened sulphur-content of the gas, but also through the ability they confer in regard to the employment of slacks, the use of which has been largely denied owing to the bad quality of the coke produced by their employment in horizontal and inclined working. In the vertical retort, a decent coke is produced even from the cheaper classes of slack.

By the extension of knowledge of such matters as these, progress is made in gas manufacture; and it cannot be denied—even if it cannot be conceded until other experience accrues that the Dessau vertical retort system is going to take us to the summit of carbonizing result—that from Berlin and Dessau has come great enlightenment to the universal gas industry.

The Design of Purifiers.

In another column we give a summarized and freely translated account of a paper, on purifiers, recently read before the Société des Ingénieurs Civils of France by M. Payet, the Permanent Secretary of the French Gas Society. The paper would no doubt well serve the object in view—namely, to bring before a general engineering audience some of the problems involved in the design, construction, and working of purifier plants. The author refers to the pattern of purifier boxes being practically the same to-day as it was at the beginning of the gas industry. Though on a superficial glance, it might appear that there was not a great deal of difference between a modern and an ancient purifier, considered as a box, closer observation would show that a world of change and improvement has been effected. Closed and confined purifier-houses have given place to open and spacious purifier-sheds, the wisdom of which has been fully demonstrated by recent purifier explosions in the former type of house. So, too, small and numerous vessels have been replaced by large and few boxes. Contrast the first separate purifier put up by Clegg at Stonyhurst College, Lancashire, just a hundred years ago (in 1807) with a dry-sealed, special grid-fitted oxide box of to-day. Old types, we know, remain; for there are to be seen in France and elsewhere purifiers with heavy cast-iron covers, and old brick and cement boxes with wooden covers. M. Payet also mentions Laming material; but we think he omits to note that it was Mr. F. J. Evans who introduced in 1849 the method of revivifying it *in situ*. Of course, the advantages and disadvantages of ground-floor, one-stage, or two-stage purifier-houses are considered. Of the last and most modern type, there is apparently but one example yet in France—at the Nanterre Gas-Works; though there are proposed imitations. It is therefore satisfactory to note that this particular installation was designed and erected by English engineers. M. Payet's design of purifier plant (of which we give a view) is not altogether dissimilar from that at Nanterre; the chief difference apparently being the replacing of gravity-bucket conveyors by skips running upon mono-rails, and elevated by lifts. In general, when we think of the great activity of invention and ingenuity of mechanical detail which have been shown during the last few years by English engineers and contractors—whether in large dry-sealed boxes, covers, and their fastenings, or in valves and their connections—we are much impressed by the progress made and the great change between 1807 and 1907. There is no "last word" in gas purifiers and purification.

The Rout of the Municipalizers.

In the municipal elections, the Provinces have followed London; and the forces of Socialism have been completely routed. Goaded by what occurred in London, desperate attempts were made by the Socialists to get a greater control in provincial local government. The Socialists sought the suffrages of the electors on comprehensive programmes, which proposed to municipalize everything, to apply the principle of direct labour to all municipal work with a minimum wage for the workers, to feed the hungry with all good things, to carry out a hundred-and-one other impossibilities, and at the same time to cut down expenditure, and relieve the poorer ratepayers of some of their burden and place more of it on the backs of the rich. But these projected activities and promises have been looked at askance by the electors. They have been awakened to the cause of the effects from which they are at present suffering—effects stamped boldly on their rate demand notes—and they trace it largely to these gentry, to their lavish handling of local affairs, and to a general abuse of their trust. The future of a continuance and a growth of this kind of thing can be judged by the past; and the communities have shown a sane determination not to place more power in the hands of those whose excesses and ill-defined projects declare that prudence with them has no balancing influence, and whose ill-mannered treatment of municipal officials is undermining good public service. By rejecting this type of would-be councillor, the Provinces, in their local administrations, have paved the way to much-needed retrenchment and reform. Already in London, there has been a substantial reduction of rates in the first year after the Progressives and Socialists were rendered impotent by a sufficient discharge of a number from further duty in the public service. The Government had better take warning from the decisive vote in the Provinces, and not allow their sympathy to go so far as to offer consolation to the Progressive and Socialist party in the Metropolis by the promotion of a public measure to bring about any hasty and so-called reform in the local administration of the Metropolis, the necessity for which has only, in the eyes of the defeated, assumed urgency since the London Borough Council and the County Council elections. If they are not careful, the Government will raise a deep protest from the people of London which will do them infinitely more harm than any favour they will obtain by their proposed sop to the Progressives and Socialists.

Peace with Honour.

Events sometimes move with surprising rapidity. Few at the beginning of last week anticipated that the intervention of Mr. Lloyd-George in the railway dispute would have had any such lightning effect in relaxing the tension, and in assuring, through a means of composing differences, an honourable peace for many—we hope for all—years to come. From His Majesty the King to the lowliest of his intelligent subjects, the settlement of what threatened to eventuate in a disastrous disturbance of the country's daily life and industry, has given relief and immeasurable satisfaction. The President of the Board of Trade never ended a day in which he had brought completion to such a successful piece of work as that accomplished, to the advantage of the whole country, on Wednesday last. In his dealings with both parties—the representatives of the Companies and the representatives of the men—Mr. Lloyd-George was (Lord Claud Hamilton tells us) "courteous, dignified, tactful, and courageous;" and the whole world can see, in the signed agreement, the statesmanlike finish that he gave to the difficult and delicate

piece of work that he undertook. The Directors of the Companies have by some been roundly rated for not having yielded on the question of "recognition." It is well for them and the entire country that they did not; for by not yielding, this *via media* has been discovered. Recognition of the unions would have left the future mantled with uncertainty; the settlement that has been arrived at ensures a peaceful arrangement of all differences for at least six years, and thereafter there can only be a withdrawal from the scheme by a twelvemonths' notice. It must be remembered, when considering the question of recognition, that those in charge of statutory concerns, as the Directors of the Railway Companies are, find the recognition of trades unions a great deal more irksome and intolerable than do those engaged in industry untrammelled by Special Acts of Parliament and rigorous restriction. To be tied on one side by legislative enactment, and to be hemmed in on the other side by trades unions, would not constitute a very happy position for the Railway Companies. However, had the Directors not stood firm, the excellent scheme now existing would never have been evolved.

The terms of the agreement are generally well understood. But briefly put, conciliation boards are to be formed for dealing with questions relating to the rates of wages and the hours of labour of any class of employees which cannot be mutually settled through the usual channels. These boards are to be formed for each Railway Company, and are to consist of sectional boards representing the Company and the various grades of employees. There is also to be a central board, constituted of representatives of the Company and members selected from the employees' side of the sectional boards. There is to be an appeal, in case of disagreement, from the lower to the higher board, and then, if necessary, to an arbitrator appointed by the parties themselves, or, failing agreement, by the Speaker of the House of Commons and the Master of the Rolls. What has been done in connection with the Railway Companies has precedent (though not quite on such an elaborate scale) in the gas industry in the joint committees—representing all grades of workers—under the co-partnership scheme of the South Metropolitan Gas Company, the South Suburban Company, and the Commercial Company, which joint committees have been at work in these cases now respectively for eighteen, fourteen, and six years, during which periods the most peaceful relations have been maintained. In the Imperial Continental Gas Association, too, there is no recognition of unions; but there is a system of committees at the stations, and that system has likewise worked well. The experience of beneficent result on the smaller scale justifies belief that the settlement in the railway world is on right lines.

We need not trouble now as to what might have been if a solution of the difficulty had not been discovered; but all engaged in the gas industry will rejoice at being freed from the stern anxieties and inconveniences that would have arisen from the serious interruption of the routine of their business by a railway strike whatever its duration. They will rejoice, too, that the agreement comprehends an assurance for a considerable distance into the future.

Auction Clauses in the Model Gas Bill.

In our "Correspondence" columns to-day will be found a letter by Mr. H. D. Ellis, the Secretary of the Commercial Gas Company, dealing with the auction clauses in the Model Gas Bill. The subject is one on which Mr. Ellis's extensive experience of the financial side of gas companies' operations renders him peculiarly qualified to speak with authority; and the appearance of his name at the foot of the letter is sufficient to ensure for his utterances the full consideration that they deserve. The point he discusses is an interesting one; and the facts are so clearly set forth as to admit of no misunderstanding. There can be no doubt that all is prejudicial to the public which either directly imposes unnecessary expenditure upon an undertaking or which indirectly leads to a similar result by opposing impediments in the path of a course of action which is inevitable in the end and which is sanctioned in principle. Useless expenditure only tends to postpone a reduction in the price of gas to the consumers. We think that Mr. Ellis has proved his case; and we confidently believe that the strong common-sense businesslike views which Parliamentary Committees generally display may be relied upon to recognize that the "not below par" enactment requires amendment. The time for depositing Bills for the next session of Parliament approaches; and we commend the matter to the consideration of those interested in Bills which will include powers to raise and issue further capital.

Municipal Ineptitude at Monmouth.

Judging from the proceedings, reported elsewhere, at the inquiry held last Tuesday at Monmouth with reference to an application by the Corporation to the Local Government Board for authority to raise £10,000 in respect of the electric light undertaking, the ratepayers will, we should think, be heartily sorry they ever allowed themselves to be dazzled by this illuminant, and, through their representatives, to be burdened with debt in order to introduce it into the town. But they were not, perhaps, altogether to blame, as they were promised a reduction of 7d. in the pound on the rates. Instead of this, however, in seven years the working of the undertaking has resulted in a loss of close upon £5000, which means 8½d. in the pound since the concern started. When the Inspector from the Local Government Board (Mr. H. R. Hooper, M.Inst.C.E.) opened the inquiry on the 3rd ult., he found that the Corporation were in a financial difficulty, and he told them very plainly that they must face facts. As he proceeded, he ascertained that the expenses incurred in connection with electric lighting amounted to quite double the estimate; and he pointed out that in the building charges there had been a wrong allocation. As neither the Town Clerk nor the Borough Treasurer could explain this, the Inspector adjourned the inquiry for a month, to enable them to do it, and also to furnish other particulars he required. To what extent they did so will be seen from our report. We need only say here that sums amounting to upwards of £50,000 were paid by the Corporation to contractors for work done, without any details being asked for; and it was put forward in justification or extenuation of this unbusinesslike proceeding that they relied upon the certificates of their engineers. But the Inspector would not listen to this excuse. He told them in very forcible language that this confidence in the engineers did not remove the responsibility from the shoulders of the Council, some of whose proceedings he characterized as exhibitions of ineptitude, extravagance, and waste of money. They had paid away about £50,000, and the accounts had been kept in a cash-book only. The present position is that the Corporation are indebted to their bankers to the tune of £11,000; and to pay off this the loan is required. An ex-Mayor of Monmouth, who expressed his disgust at the whole business, made an appeal for an official audit of the accounts; and a ratepayer voiced the desire of his fellow burden-bearers that the repayment of the loan should be spread over as long a period as possible. The Monmouth Corporation have learnt a lesson in municipal finance which should be permanently beneficial to them and to others.

The "Coalite" Correspondence.

Comment on the correspondence now appearing in our columns on the question of "Coalite" may with advantage be deferred while so much of interest is being contributed by others. There is one matter, however, to which we desire at once to call special attention. Letters have been received for publication the senders of which have wished to mask their identity by appending fictitious names to their communications. The matter composing the letters referred to indicates that they are written by persons of no technical qualification in respect of the question with which they are dealing. The letters really only consist of a tissue of very general observations, which are sprinkled freely with the personal pronoun "I." In the case of certain of these writers, we cannot (apart from their want of technical knowledge of the subject), find, from the last published list of shareholders in the Coalite Company that they are even financially interested in the matter. It can therefore only be assumed that they are irresponsible persons, and that, while the "hands are the hands of Esau," the "voice is Jacob's voice." Certain of these writers will, we believe, know what is meant. Therefore, let it be understood now that, unless there is some special technical point bearing on this Coalite question worth publishing in letters the source of which it is desired shall not be disclosed, or unless we are satisfied that position or qualification is entitled to respect, as in the case of the letters appearing this week of "M.Inst.C.E." and "J.D.B.," we shall decline to publish them.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 511.)

THE memorable week has come and gone in which the Bank of England rate rose to 7 per cent.—a rate unattained for 34 years. Inconvenient as this step must necessarily be to many, it is as gratifying as it is remarkable to note that the Stock Exchange has stood it wonderfully well—thanks to small commitments and a healthy state. In fact, Consols closed unchanged from their opening price; and Home Rails, with one or two other leading lines were rather better. But meanwhile some eventful hours had passed. The calm apparent on Monday morning had been rudely disturbed by the early announcement of an advance in the Bank rate from 5½ to 6 per cent. Prices fell, and business was severely restricted. It, however, later on cheered up, upon more favourable New York advices. Tuesday continued in a noticeably cheerful mood—and, though business was quiet, there was some steady buying. The American position looking much clearer. On Wednesday, movements were somewhat irregular, but favourable on the whole; Home Rails continuing to improve the more the true effect of the Lloyd George settlement was studied. Thursday opened with unimpaired brightness, and perhaps with too much of a rush to get in at near bottom prices. But the advance of the Bank rate to 7 per cent. stopped this, and so did good in more ways than one. Friday was sustained by a clearing of the American horizon, and a disposition to take the best view of good points. Much buying for investment proceeded. Saturday was a fair day, but the best form was not maintained up to the close. In the Money Market, there was always a good supply at firm current rates to meet short demands. At the close, discount rates were showing a tendency to relax their previous tension. In the Gas Market, the volume of business was up to the level of the week before; but it lay to a great extent within the issues of the Metropolitan Companies. Gaslight and Coke ordinary was active at rather easier figures, ranging from 91¾ to 90¼—a fall of 1 in the quotation. The secured issues marked 86½ and 87¼ for the maximum; 104 and 105¾ for the preference; and 82 to 82¾ for the debenture. South Metropolitan was quiet and unchanged; stock changing hands within the limits of 119 and 120½. The debenture was done at 81⅛ and 82½. Commercials were more active; and dealings took place in the 4 per cent. at from 101 to 103; in the 3½ per cent. at from 99 to 101; and in the debentures at 81 free. In the Suburban and Provincial group, Bournemouth was done at 28⅜ and 28¼, British at 40¼ and 41, Brentford at 245 free, ditto new at 182, Brighton "A" at 157¾, South Suburban at 116 and 114¼, Tottenham debenture at 99, Wandsworth debenture at 75, and West Ham at 103 and 102½. The Continental Companies were very quiet. Imperial ranged from 174 to 175, and Union marked 113¼. Among the undertakings of the remoter world, Cape Town debenture was done at 95, Oriental at from 140 to 140½, Primitiva preference at from 4⅞ to 5 1/16, ditto debenture at 94¾, River Plate at 12⅝ and 12 11/16, and San Paulo at from 13⅛ to 13 7/16.

ELECTRIC LIGHTING MEMORANDA.

A Pause in the Requirement of New Stations for Lighting Purposes—Loans and Revelations—A Westinghouse Flame-Arc Perfection—A Simplified Arc Lamp—The Moore Tube Light.

FOR some time past, there has been evidence that purely for electric lighting purposes there has been a falling off in the rate of establishment of new generating-stations and in the demand for any large sums for extension purposes. The applications to the Board of Trade the last few years for Electric Lighting Provisional Orders have been on the decline, and the last twelve months have witnessed fewer applications to the Local Government Board for sanctions to loans of substantial amount. Is this due to most of the generating-stations throughout the country having been equipped well beyond what was necessary; is it that the private demand for electricity has not come up to expectations; is it that the new consumption-reducing lamps are now beginning to have effect, and that electrical cookers and radiators have not rendered any appreciable compensatory aid; or is it that the local authorities are deferring as long as possible the, for them, evil day when their finances and doings must be submitted to the scrutiny of an Inspector of the Local Government Board? If the Board would allow some of the local authorities to choose their own Inspector, we venture to think there are those of the Board's officials who would be overworked, while others would find their engagements at loan inquiries few and far between. Certain local authorities, in connection with their electricity undertakings, have, for we suspect one of two reasons—either for postponing the inquisitorial inspection, or else for lightening the immediate financial repayment obligations of their electricity concerns—taken to borrowing somewhat heavily from their bankers. Maidstone (alluded to last week) is a case in point; Monmouth is found by the Local Government Board to be in similar plight; and at Colwyn Bay, there has been expenditure on work for which loans have not been obtained. In the case of Monmouth, there has been borrowing from the bank to the extent of £10,000; but the Corporation have been quite unconcerned about any repayments. So municipalities, with electricity undertakings (which, if the truth is to be hidden from the public, cannot be run on straight financial lines) walk round Acts and Provisional Orders and other regulations that are drawn up for their guidance and for the protection of the ratepayers.

As we have said, there have been comparatively few inquiries lately; but, in connection with certain of those that have been held, the Local Government Board are not relaxing their vigilance. One was commenced at Surbiton the other day for a loan of £20,000; and the Inspector was Mr. H. Ross Hooper. For some time the ratepayers have had a suspicion that all is not well in connection with the electric-lighting undertaking; and it is thought that it is being run for the benefit not of the town but of Callender's Cable Construction Company, Limited, who constructed the works, and are now operating the concern under a duly-executed agreement—the Council finding the capital. The Inspector managed during the inquiry to let a little light on to the "inner working" of the undertaking. The plans on which the original loan of £50,000 was obtained have, since the Local Government Board had them under review, been completely departed from; and the trend of the Inspector's inquiries pointed to a belief on his part that every charge possible had been planked on to capital account, and that the charges were not always so moderate as they might have been. In building the station, for example, the type of steam-boiler was changed; and whereas the estimate was for three boilers having an evaporative duty of 24,000 lbs., those put in only had a capacity of 16,000 lbs. The Inspector's comment was: "I see you made a saving on the boilers of £31 9s. 3d.; but the boilers have 33 per cent. less capacity." The only and brilliant explanation offered was that the brickwork for the new type of boilers was more expensive; and this was the cause of the saving being so small. More expensive brickwork; less duty from the boilers! What a pretty memorial to municipal management with economy and efficiency! A further example, is the charge of £9 1s. 6d. for an "effective service;" and about the moderateness of that charge the Inspector appeared somewhat dubious, with his knowledge of prices and details. At the rate things have been going on, the vision rises of a pretty balance on capital account with obsolete plant for the ratepayers of Surbiton some day. As in numerous other inquiries, the Inspector could not extract all the information he required at the first time of asking, and more is to be heard of the matter. At Dover, a loan of £13,264 was asked for months ago; but the Local Government Board are still wanting some further information. It is also appropriate to notice here that the Board are evincing a somewhat particular care about the length to which they go regarding loans for unpremeditated or indefinite works. In the Surbiton case, the expenditure already incurred and in prospect amounts to something under £15,000; while the Council ask for £20,000. The Inspector was curious as to what the Council anticipated doing with the £5000; and it will be strange if the Board concede all the money that is not earmarked. The Board, it is also observed, have refused sanction to a loan sought by the Willesden Council for sites for a future generating-station and sub-stations, on the ground that there is no present need of sites, and no certainty that they will ever be required.

As in the case of inquiries for loans, it is some time now since we had anything to say about new electric lamps. Several references to new high-power lamps have, however, lately appeared in the electrical press; and the articles have been read to ascertain whether there is anything startling about the fresh comers. Of course, every electric lamp that comes out is claimed to be something better than any of its predecessors. So it ought to be. But it cannot escape observation that frequently, after notice in our electrical contemporaries, very little more is heard about the wonderful performances of the lamps. Let the remark not be mistaken. It is not suggested that the notices kill the lamps. But experience shows that, generally speaking, one lamp is much the same as another in the final result; and therefore most of the new lamps subsequently take their places in the line of commercial competition, and only very occasionally does one realize much greater favour than any other. Before us is an article on the Westinghouse metallic flame arc lamp. If any one knows how to laud up Westinghouse productions, it is those in the Westinghouse service in the "publicity" department. This metallic flame arc lamp, if everything said about it is true, is a remarkable thing. All that other people have not thought of in connection with flame arc lamps will be found packed away in the "simple and inconspicuous, but symmetrical exterior" of this lamp; and therefore to try to excel it would surely be to waste time, money, and energy. What more can be wanted than a lamp that gives double the efficiency of the carbon arc, affords very good illuminating results, yields a white light, and distributes its illumination uniformly—over what area is unknown!

It is also gathered that in this lamp the use of carbon electrodes has been abandoned; a metallic oxide is used for the negative or upper electrode, and the lower or positive electrode is formed by a metallic button. The use of these electrodes results, it is said, in the formation of a highly luminous arc, which greatly increases the efficiency of the lamp for lighting purposes; the consumption of current has been reduced, and the burning life of the electrodes has been lengthened. Another difficulty which has been overcome is the deposit of soot from the burning electrodes, not only upon the reflectors and globe, but upon the electrodes themselves. The lamp has been designed to operate upon a direct constant current. The length of the negative electrode (which in this lamp is the one that burns away) is not limited excepting by the height of the lamp itself. Miracles are the result of the location of the

electrodes—among other things dark shadows below the lamp are avoided, as are highly concentrated zones of light in its immediate neighbourhood. About the soot question, too. "In the past, the use of metallic electrodes has been handicapped by the fluffy reddish oxide produced sticking to everything it touched, and accumulating very rapidly upon the globe and reflector, as well as upon the electrode." In this lamp, the trouble has been guarded against by means of air currents. For instance, deposit on the electrode has been prevented by a "current" of air being directed downwards and surrounding the electrodes with a "wall" of air. Of course, a "current" cannot be a "wall;" but we will not kick at trifles in expression. But then another "wall" of air prevents the oxide from collecting on the reflector or globe. These two currents of air meet and pass up the chimney carrying the fumes from the arc; and here again they prevent the sooty oxide from coming into contact with the central guide-tube or the exterior walls of the chimney. Why has not somebody before applied such a simple expedient for the prevention of this soot trouble? The air-inlets, it also appears, are so designed that reverse currents are impossible; and while the intensity of the wind naturally affects the intensity of the draught, high winds cause no trouble, but are said to be, to a degree, advantageous as contributing to increasing the efficiency with which the "by"-products [why "by"?] of combustion are removed from the lamp. Nature and everything else seem to have been very friendly disposed towards the Westinghouse people in designing this lamp, and to have conspired to place the fullest success in their way. But after this blast on the Westinghouse horn, we have not heard that the walls of Jericho have fallen down flat.

Next to the better distribution of the light yielded by arc lamps, a thing much to be desired is simplification in the construction of such lamps. The "Newarc" lamp of the Albany Engineering Company is a fresh construction; its distinctive feature, it is claimed, being the fewness of its working parts. The drawing of the lamp as given in a contemporary has been examined; and it is seen that all the letters in the alphabet from A to Z have been pressed into service as references to the features of this lamp of "few" parts. The distinctive feature of the lamp being the fewness of its parts, the organic structures of its predecessors must have been wonderful indeed in their complication. We will not profess ignorance of the interiors of those predecessors, nor will we be guilty of saying that the "Newarc" is not, after all that is said about it, a complicated structure. When electricians get an arc lamp as innocent of complication and moving parts as a gas-lamp, they can begin to talk about simplification.

Another form of electric light that has received an amount of advertising out of all proportion to the meagre popularity attained is the Moore tube light. An article on the subject—one of several—brings the information up to date about this light. In the system, vacuum tubes are used of comparatively enormous length, supported round the walls of a room near the ceiling, or in any other advantageous position—being excited by high-pressure alternating current. The electrical apparatus other than the tube itself is concentrated in a small box, which contains a transformer, the terminals of the tube, and a regulating-valve. The tubes, which are about $1\frac{3}{4}$ inches in diameter, may be over 200 feet long. A 200 feet tube absorbs a gross power of 3·5 kilowatts, and imparts an illumination equal to about 2400 hefner units. Apparently constant light intensity and efficiency are not obtained immediately on starting the lamps, because we read that that condition is "soon" reached; but "soon" is not a particularly definite space of time. The gas contained in the tube determines the colour of the light, which is pure white with carbon dioxide, and yellow with nitrogen. In use, the vacuum in the tube continually rises; and it is essential to introduce a supply of gas from time to time to restore normal conditions. In this connection is found the latest improvement in the lamp; this being the introduction of an exceedingly ingenious automatic regulating-valve for feeding the gas to the tube. Although the system has not taken hold of the public fancy, it has an advantage over ordinary electric lamps with their eye-dazzling small sources of light, in its low intrinsic brilliancy. A published comparison states that the Moore tube (at 12 hefner units per foot) has a brilliancy of 0·66 hefner unit per square inch, while the Cooper-Hewitt mercury-vapour lamp gives 19 hefner units, electric incandescent filaments at the rate of 250, Nernst glowers at the rate of 600, and the arc crater at the rate of 10,000 hefner units per square inch. Even so, people are not running after the Moore light, which is not without its drawbacks and frailties.

Analysis of Mixtures of Air and Combustible Gases and Vapours.—In the number of the "Comptes Rendus" for the 14th ult., M. Jean Meunier dealt with this subject. With ordinary measuring cylinders of fixed volume, the proportions of the mixtures used can only be multiples of the volume given by the pipette, and it is impossible to weigh the gas for analysis. According to the "Chemical News," the author's improved apparatus for the purpose consists of a measuring cylinder graduated in cubic centimetres, and closed at the bottom by a movable copper piston on which some mercury is poured. The upper end of the cylinder is somewhat constricted, and can be closed by a glass cap with a cock through which the gases to be investigated can be introduced. A known weight of volatile liquid is put into the measuring cylinder by a pipette, and by adjusting the piston a given weight of gas can be made to occupy any desired volume.

THE NEW DEPARTMENT AT LEEDS UNIVERSITY.

The Stipend for the Professor of Fuel.

In the "Journal" for the 24th of September, we gave a list of the contributions which had been received up to that time in response to Sir George Livesey's appeal for funds to provide the stipend attaching to the new Professorship of Fuel (Solid and Gaseous) at the Leeds University. We are pleased to learn from Sir George that the fund is progressing, and now stands as follows:

	£	s	d
Leeds Corporation Gas Committee	100	0	0
Gaslight and Coke Company	100	0	0
South Metropolitan Gas Company	100	0	0
Commercial Gas Company	30	0	0
Newcastle-upon-Tyne Gas Company	20	0	0
South Suburban Gas Company	20	0	0
Wandsworth and Putney Gas Company	10	0	0
Mr. John Holliday (East Hull Gas Company)	3	3	0
	£383	3	0

It only remains for a few additional contributions to be received for Sir George Livesey's task to be satisfactorily completed. He suggests that the annual subscriptions should be collected in October each year by the Secretary of the Institution of Gas Engineers, if the Committee will kindly undertake the work. He fully believes the object a thoroughly good one, and likely to be an advantage to the gas industry generally.

KNIGHTHOOD FOR MR. D. FORD GODDARD.

It is with very considerable pleasure that we notice, on the list of honours conferred by His Majesty the King on the occasion of the anniversary of his birthday, a knighthood for Mr. Daniel Ford Goddard, the senior Member of Parliament for Ipswich. The new knight, as most of our readers are aware, is closely identified with the gas industry; his father, the late Mr. Ebenezer Goddard, having been Manager of the Ipswich Gas Company for forty years, and the son succeeding him at his death in 1882. He held the position till 1887, when he retired, and Mr. J. T. Jolliffe was appointed. He, however, retained a certain amount of supervision over the Company's affairs in the capacity of a member of the Board, and subsequently a larger share as its Chairman. He is also Chairman of the South African Lighting Association, Limited, and Deputy-Chairman of the Tottenham and Edmonton Gas Company. In 1886, he entered the Ipswich Municipal Council; and in 1891 was elected Mayor—a position his father had filled three times. The following year he contested the borough at a parliamentary election, but was not successful till 1895. At the last General Election, he was the first member to be returned; and he went back to Westminster at the top of the poll, with the largely increased majority of nearly 1800 votes. Moreover, his election and that of his colleague, Mr. F. T. Cobbold, meant the capture of the first Conservative seat. He is a hard-working Radical Member of the House of Commons, where he is Chairman of the Public Accounts Committee; but he is also an active local philanthropist, being the founder of the Ipswich Social Settlement, to which he devotes most of his spare time. With regard to this work, we think it is only due to its initiator to quote the following sentences from an appreciative notice of his life-work which appeared in the "East Anglian Times" last Saturday:

> The Social Settlement in St. Clement's is a centre whence radiates a far-reaching influence which permeates life in every part of the borough. It is authoritatively stated that, in the foundation of this Settlement, Sir D. Ford Goddard expended a capital sum of £11,000; certainly he has lavished upon the work all that appeared to be necessary to bring light and joy in a part of the borough—the district in which his boyhood home was situate, and in which his business life was mainly spent—where it was greatly needed. Sir D. Ford Goddard on one occasion tersely expressed his purpose in undertaking this great work as that of "making men's lives happier and better;" and there will be a very general consensus of opinion that he has succeeded to a degree granted to few public-spirited men. The substantial monetary gift to the borough represented by the foundation of the Social Settlement is merely a portion of his beneficence. From the beginning he has given regular personal service in the conduct and management of the institution, more especially in connection with the Sunday classes, at which the attendance sometimes exceeds 1000—all adults. So keen has been his interest in this work, that at one time he declared his intention of retiring from Parliament in order to conserve his strength, that he might the more effectively discharge his self-imposed task. His influence and work have extended to other spheres, religious and philanthropic. . . . In honouring the senior member for the borough—one of its conspicuously generous philanthropists—King Edward has taken a step which will be supported by all classes and all creeds.

It is not, however, for his municipal and philanthropic work, but for his services to the nation in the capacity to which reference has been made, that he has received the knighthood just conferred upon him. We congratulate him most heartily on being the recipient of this distinction.

IN RECOGNITION OF LONG SERVICE.

A Medal for Imperial Continental Gas Association Workers.

THERE is no question that a suitable and lasting recognition by employers of the long and faithful service of workmen does incite a desire among those still disqualified by the time-limit to eventually become the happy possessors of the recognition. The Imperial Continental Gas Association have experienced the truth of this, and have found such recognition an inestimable factor in the management of their army of workers. Hitherto, the custom has been to mark a quarter of a century's continual service and loyalty by handing to the man a money present—say, 100 marks; but this year it has been thought that it would be a nice thing if, over and above a monetary reward, the event was marked by something of a more permanent character. The Directors of the Association have adopted a form of doing this that is very much appreciated in Germany. They have instituted a sort of Roll of Honour; and each man when he has attained 25 years' continuous service will be presented with a handsome framed diploma and a silver medal, looped and ribboned for wearing. On the obverse side of the medal, there is the inscription in German (as illustrated) "For Twenty-five Years' Faithful Service;" and on the reverse side is a sketch of Prometheus snatching fire from the sun—symbolical of the gas manufacturer recovering the light and heat stored away in coal.

Considering that this new commemoration is for 25 years' continuous service, the number of men of the Association's service entitled to it is somewhat remarkable. There were at the beginning of this year, 95 pensioned men who have served the Association in Germany for 25 years, and 183 men who had spent a similar period in the service, and were still working—making a total of 278. But during this year a further 25 have run the course of a quarter of a century's service, so that there are 303 who are entitled to the recognition, and are looking forward with pride to receiving it. Mr. R. W. Wilson, the Secretary of the Association, speaks highly from his experience of the value of some form of recognition for long and faithful service. He is confident that it makes the men hang well together, creates an ambition, and encourages good conduct. The Association have had many delightful evidences of the men's fealty, and of the excellent relations and friendship that subsist between officers and men—due largely to this recognition. In connection with the Association too, they have, and have had in operation for years, precisely what is now to be established in the British railway world—Committees of Workmen; Unions not being recognized. The men choose their own representatives for the Committee; and the Committees have monthly or bi-monthly meetings, which one of the superior officers attends, and to him complaints can be made if any grievances exist. These are put in the form of minutes, and sent to the Chief Engineer; and if he cannot deal with any of them, they are submitted to London, for consideration by the Board. The system works exceedingly well, without the interference of any outside body. That this is so, and that in the Imperial Continental service there is little cause for complaint, testimony is found in the fact that 303 men in 1907 are entitled to the newly-established recognition for long service.

But while the workmen are receiving this distinction for long service, we hear nothing about the staff; and having met many members of the staff of the Association abroad, it is within knowledge that several can show an unbroken record exceeding twenty-five years.

To a recent number of the "Annales des Ponts et Chaussées" M. Le Chatelier contributed an article regarding the action of sea water on cement and concrete. He stated that all hydraulic binding agents without exception may be decomposed by sea water, though the rate of this action varies within wide limits. The essential condition to render cements immune from decomposition in the sea is to reduce as much as possible the volume of water employed in gauging the cements.

PERSONAL.

Among the twenty successful candidates at the Intermediate "LL.B." examinations of the University of London, held last month, appears the name of Mr. C. E. BRACKENBURY, Barrister-at-Law.

In commemoration of his thirty years' service as Engineer and Manager of the Cleckheaton Gas-Works—first under the Local Board and latterly under the District Council—an illuminated address was recently presented to Mr. G. H. NIVEN by his fellow-officers, at a complimentary dinner given in his honour at the Royal Hotel. The toast of the evening, "Our Guest," was proposed by the Clerk to the Council (Mr. J. H. Linfield) who showed how the consumption of gas had gone up from 30 to 117 million cubic feet per annum, while the price had been brought down from 4s. 2d. to 2s. 6d. (further reduced by discount for prompt payment to 2s. 3d.) per 1000 cubic feet, during Mr. Niven's management. He said that in the thirty years during which Mr. Niven had been in the service of the Local Authority, his relations with the staff had ever been of the most cordial character; and they sincerely hoped he would have before him many years of unalloyed happiness, and would retain nothing but the happiest recollections of his associations with the official life of Cleckheaton. Mr. Niven expressed his gratitude for the kind references made to his work and for the favours he had received from both past and present councillors and the staff in his charge; and he assured them that the testimonial they had presented to him would be prized more than anything else he had received by way of gift, and would be cherished by him and those belonging to him as a very dear and sacred thing.

OBITUARY.

We regret to record the death last Thursday, at "Riverside," Beddington, of Mr. SIMPSON ROSTRON, one of the Directors of the South Metropolitan Gas Company, and also of the Hong Kong and China and Monte Video Gas Companies. The deceased gentleman, who was a barrister of the Middle Temple, was in his 75th year.

A sad incident in connection with the Manchester Gas Exhibition, which was brought to a successful conclusion on Saturday, was the death, last Tuesday, of Mr. W. C. WADDINGTON, the Superintendent of the Street Mains and Lighting Department of the Manchester Corporation, under whose supervision the piping of St. James's Hall for the purposes of the exhibition was carried out. He had been connected with the department for about 45 years, and was filling the position of senior draughtsman in 1875, when he was appointed Superintendent in succession to the late Mr. T. Rafferty.

Mr. JOHN KING, the Manager of the Bo'ness Gas Company, Limited, died at his residence there on Tuesday evening last at the age of 57. He was a native of Falkirk, and in early life held appointments in Dumbarton, Buckie, Gourock, and Kilmalcolm. Twenty years ago he was appointed Manager of the Bo'ness Company. During his occupancy of the position, very large extensions of the gas system were carried out, and nearly all the plant was renewed; and the annual make of gas has increased from 10 to 25 million cubic feet. At the end of July last, Mr. King was granted two months' leave of absence on account of ill-health; Mr. David Stiven, who was in the service of the Edinburgh and Leith Gas Commissioners, being appointed interim Manager. Mr. King leaves a widow and a family of six children. Mr. Stiven has now been appointed Manager.

Among the awards made by the Council of the Institution of Civil Engineers for the year 1906-7 was a Telford Gold Medal to Mr. Dugald Clerk.

Mr. Joseph Taylor, who was Chairman of the Pontefract Gas Company, left estate entered for probate at £10,047. Mr. Samuel Hornby, who filled a similar position in the Harrogate Gas Company, left £111,784.

The late Mr. Leveson Francis Vernon-Harcourt, M.Inst.C.E., Professor of Civil Engineering in University College, left estate valued at £56,535 gross, with net personalty £49,085. He bequeathed £1000 to the Institution of Civil Engineers, in memory of the many advantages he had derived from its library and lectures, to found a yearly or biennial (in the discretion of the Institution) lecture, medal, premium, or prize, in connection with river, canal, or maritime engineering. The residue of his property he left to his wife for life; and after her death he left to the University of Oxford, if there shall have been founded there in the lifetime of himself and his wife a school of engineering or mechanical science, £1000 for the promotion of the teaching of engineering science there, and also his Transactions and Proceedings of the Institution of Civil Engineers, and 20 volumes of the "Annales des Ponts et Chaussées," being his Telford premium in 1882, and a selection of his other engineering works, to form the basis of an engineering library; a selection of his engineering works to the Institution of Civil Engineers; and £200 to University College, London, for a yearly prize in civil engineering.

SECOND MEETING OF THE AMERICAN GAS INSTITUTE.

[From an American Correspondent.]

It is a "far cry" from Michigan to Washington (D.C.); but following my visit to the Michigan Association at Battle Creek, as described recently in the "Journal" (*ante*, p. 97), attendance was put in at the American Institute meeting in the Capitol, on Wednesday, Thursday, and Friday of the week ending the 19th of October. At the outset, I will say that the formation of this premier American Institute bids fair to fructify as well as did the English amalgamation, though in many ways this second meeting was a disappointment, possibly due to the very high standard witnessed in Michigan. Living in the Western States, one meets a great number of New Englanders, who also live, work, and thrive in the West, but keep up one continual round of praise of the Eastern States. So in going from what one might call the land of promise to what may be termed the comparative land of performance, it was natural to expect good things from the great body of Eastern gas engineers there assembled. It is better to expect not!

The meeting was a very large one, as on the entry into the New Willard Hotel every available room seemed to have been booked months before; and it was estimated that upwards of 400 engineers registered their names before entering the meeting-room on the tenth floor of the hotel. President Walton Clark took the chair at 10.30 a.m.; and he must have felt, on examining the sea of faces before him, that the future of the gas industry in America is about to enter into a new era of progress, even if entrammelled with graft, boodle, and politics, and the octopus clutch of the suckers wielded by company promoters. You people in England, who live in a pure business atmosphere, can have no possible idea what it feels like to be in business in the States. Once a company is started over here, it is worked on thoroughly honest lines, there being no commission work in the placing of contracts; but in forming a company the payments to councillors, promoters, stockholders, &c., is one large swindle.

At the meeting, one missed the sight of English visitors, though Mr. H. L. Doherty, straight from his trip to the Old Country, seemed to breathe a kind of progressive spirit. Very shortly we may look for a better exchange of views personally at these meetings, because it would be just as quick and easy to cross from England as it is to travel across America; and the trip is one which would greatly add to the importance and authority of international gas meetings. It is a mistake to live an isolated business existence; and it is almost necessary that, in some way or another, different countries should send delegates to each other's gatherings to further the interests of the industry as a whole.

To open the meeting, Mr. Clark called upon the Hon. H. B. T. MacFarland, the President of the Board of Commissioners for the District of Columbia, to address the assembly; and this was the opportunity of the Right Honourable Commissioner to show how a welcome can be extended to a visiting institution in a most warm and witty manner. The earlier parts of the proceedings were more or less of only local interest, and dealt chiefly with the election of new members, the statement of accounts, &c. In the current year about 148 members were added to the existing roll of 1139, and some 60 were struck off or retired for various reasons. The papers were not taken in order; but began with that of Mr. Charles H. Dickey, the President of the Maryland Meter Company, Baltimore, entitled "The Obligations Imposed by the Possession of a Franchise." As this is of interest to American Engineers only, I pass it by with words of praise for the able manner in which it was prepared and read.

Mr. Clark was unable to occupy the chair at the afternoon session, owing to temporary indisposition; so the Vice-President, Mr. Charles F. Pritchard, of Lynn (Mass.), took up the reins. He displayed his ability in a marked degree; and it was shown, after the vote had been taken for the President for the ensuing year, that Mr. Pritchard had been supplanted in a way that destroyed one's preconceived notions of what is an established rule. This was the one unpleasant note in the whole proceedings; and it must be as distasteful to the elected as to the defeated. We feel sure that the friends in England of Dr. A. C. Humphreys, even despite his assurance that he did not seek election, will later on wish his too eager supporters had held their hands a little. No better man could be elected to the presidency of the American Gas Institute; but very nearly half the members present wished Mr. Pritchard had been given the honour, as had been intended. The latter very magnanimously proposed, after the decision was made known, that Dr. Humphreys be elected without a dissentient; and he did this in a way that pleased everybody. Quite a number of engineers thought that, even considering the great amount of really good work Dr. Humphreys has done for the gas profession, his connection with the manufacturers and the contracting end of the business made his election look too much like advertising. Personally, I feel that Dr. Humphreys knew nothing of the way in which he was being "boosted" for the presidency by over-zealous friends; and consequently I venture to refer to the feeling of a considerable portion of the attending engineers.

Immediately after the discussion on Mr. Dickey's paper, Dr. Humphreys was asked to read his paper on "Depreciation;" and though he was evidently labouring under a severe cold, which at times made his voice almost inaudible, he tackled his long and difficult subject in that forceful and deliberate way which is so characteristic of him. Following the paper was a communication from the New England Association on "Uniform Accounting and Depreciation," read by Mr. W. H. Gardiner, jun., a Consulting Engineer of New York, and one closely identified with the Company who exploit the patent benches of Mr. Doherty.

On Thursday morning, Mr. Clark was happily again in his place, and called upon Mr. Milan R. Bump, as Editor, to present the result of his labours in the "Wrinkle Department." If everything else was cut out, the Institute would still be able to point with pride to the great amount of good work it has done in this department. The communications are by far the best and most voluminous as yet contributed to this department; and we were told that time and space prevented the publishing of a vast number of additional "wrinkles." It seems to me that it would be a good thing if a similar idea could be carried out in England in the hearty spirit of co-operation manifested by American gas engineers.

Succeeding Mr. Bump came Mr. W. H. Gartley, who acted as spokesman for the Committee on "Methods of Taking Candle Power." The paper was most interesting, and the discussion no less so. One point which it brought out was in a remark made by one of the speakers, that the percentage of error in taking readings had been found by him to be greatly reduced when the men were brought to read both flames alternately with each eye. Many men have not eyes alike, and this results in one or other of the lights on the screen being seen to disadvantage. By transposing the lights, therefore, the chance of error is very greatly diminished.

Dr. Hyde, of the National Bureau of Standards, was asked to say something likely to be of help to gas engineers; and in an impromptu address, which developed into a lecture, he gave some excellent advice, and made what was most certainly the speech of the meeting. He looked quite boyish when he stepped upon the platform; but his statements and conclusions were of such excellence, that I am trying to get a vebatim report of his remarks. His plea was for one standard of candle or test light throughout the world; and he asked for an effort to be made to make it uniform for gas and electric light. The difference between the European standards is not very great; but in America, as between gas and electric light, it is more than 5 per cent. Dr. Hyde has this matter much at heart; and it is advisable that somebody representing English practice should get into communication with him to try to further this praiseworthy scheme.

There were other papers read, and some prepared and not read or published. Included in the latter is one by Mr. W. A. Baehr, entitled "A Bulletin of Instructions on the Care and Operation of Recuperative Benches." The paper was prepared, but not submitted in time for publication; and, unfortunately, Mr. Baehr was called back to St. Louis before he had time to read it. In conversation with the author, it was discovered that the paper was a most elaborate one, having taken seven months of hard work to prepare, and when in manuscript form occupied 142 pages of foolscap, together with innumerable statistics and diagrams. In preparing this mass of literature, Mr. Baehr asked the co-operation of gas engineers throughout America, and sent out a list of a hundred questions, and indicated how they should be dealt with. This list shows in a very instructive manner how American gas engineers look upon the subject of benches.

The banquet, on the evening of the second day of the meeting, was a great success; and one accustomed to the somewhat sombre character of such gatherings in England is rather amazed at the gaiety and youthful spirit so much in evidence. Americans work hard; but when they play they certainly do so with spirit. There were, of course, many speeches. Taken as a whole, the meeting was a very good one; but it had not that keen business spirit in evidence which was found at the Michigan meeting. Soon we shall find that the Easterner has lost his supreme place in this country.

Outside the gas business, but still tending to show the way things are moving, we are now hearing daily of huge failures on Wall Street, and a general tying-up of business, shortness of money, &c. In previous years, the West would have suffered; but not so now, when we find trade and industry flourishing there as it never did before, despite the panic in New York. Nowadays it looks as if the Central West, Far West, and South West do not have to rely upon New York and Boston for financial help; and this will prevent the awful periods of trade depression which hitherto seemed to ensue when the jobbers and grafters on Wall Street met their just fate after an attempt to control some principal market, such as copper, corn, wheat, or oil.

Abandonment of the Proposed "Technolexicon."—According to a letter which has been circulated by Herr Theodor Peters, the Director of the Society of German Engineers, the Society have decided to abandon the project of publishing a "Technolexicon" in several languages, which was started about two years ago. It was intended that the first volume should appear next year; but the preparation of the work has been found to be far more expensive than was contemplated, and its production would exceed the pecuniary means available for the purpose. It may be remembered that the Institution of Gas Engineers promised to assist in the compilation of the work, and that the matter was placed in the hands of Dr. Colman and a Committee.

THE WOODALL-DUCKHAM VERTICAL RETORT SYSTEM AT THE NINE ELMS WORKS.

The Gas-Production Results in Ordinary Operation.

A SHORT time since, it was our pleasure to publish a brief description of the two settings of four vertical retorts each on the Woodall-Duckham continuous carbonization system which had been installed at the Nine Elms works of the Gaslight and Coke Company. The plant has just been taken over by the Company; and therefore the time is opportune to lay before our readers some of the results of the working under ordinary conditions. The figures published in the "JOURNAL" on the 4th of June last were results at Bournemouth; those now given are figures obtained at Nine Elms, and attested by Mr. T. S. Lacey, the Engineer of the station. We all know what a stickler for accuracy in his work is Mr. Lacey; and where we find his sign-manual at the foot of figures, we may be positive of their correctness.

Now that the Gaslight and Coke Company have taken over the settings, a thirty days' run is being made; and in the first table we give the results obtained during three days. The thirty days' run is not intended for show purposes; the Engineer is dealing with the settings just as he would deal with any other of his carbonizing plant. No favour, but justification by merit, is all the plant has to expect at his hands. It is, however, only right to explain that in this run all sorts of coal are being used; and that employed in the working of which the resulting figures are now published was coal that had been stored in the open and was consequently wet. No allowance has been made for moisture. Be it remembered, too, that this is "straight" coal gas; very little steam, as the figures show, finding its way into the retorts from the quenched coke below. It will be observed that in the three days not far short of 13,000 cubic feet of gas of 15·82-candle power were being obtained per ton of coal. The figures may be presented on their own merits without comment. They speak for themselves. The low make per ton in the first return is due to the starting up of the plant.

Test on Woodall-Duckham Vertical Retorts—Monday, Oct. 28, 1 p.m., to Thursday, Oct. 31, 1 p.m.

NINE ELMS STATION OF THE GASLIGHT AND COKE COMPANY.

Day and Time.	Coal Carbonized. Tons.	Total Gas Made. Cubic Feet.	Gas Made per Ton.	Illuminating Power.	Sperm Value.	Calorific Value. Gross B.Th.U.	Calorific Value. Net B.Th.U.	CO_2.	H_2S.
1 p.m. Monday, Oct. 28, to 6 a.m. Tuesday, Oct. 29	10·6	133,927	12,635	16·18	701	602·5	532·8	2·13	1·37
6 a.m. Tuesday, Oct. 29, to 6 a.m. Wednesday, Oct. 30	14·2	183,231	13,062	15·53	696	592·7	524·3	2·3	1·4
6 a.m. Wednesday, Oct. 30, to 6 a.m. Thursday, Oct. 31	14·4	177,073	12,297	16·2	682	599·7	530·4	2·2	1·3
6 a.m. Thursday, Oct. 31, to 1 p.m.	4·2	54,063	12,871	15·3	676	580·5	517·8	2·4	1·3
Total	43·4	548,294*	12,633*	15·82†	686†	593·8†	526·3†	2·26	1·3

* Measured with CO_2 and H_2S in. † Gas tested with CO_2 in, under London regulations.

Coal used, Burley Silkstone (no allowance for moisture).
Average Composition (unpurified).
O = 0·66 per cent.
CO = 6·90 ,,
CO_2 = 2·26 ,,
H_2S = 1·30

Analysis of Sample of Gas Collected between 12 p.m. Wednesday, Oct. 30, and 6 a.m. Thursday, Oct. 31 (Purified from Sulphuretted Hydrogen).

CO_2 =	2·22
C_nH_m =	2·88
O_2 =	0·27
CO =	7·41
CH_4 =	35·05
H_2 =	45·85
N_2 =	6·32
	100·00

Illuminating Power, 16·4 Candles.
B.Th.U. Gross 607, Net 543, by Boys Calorimeter.
do. 609, Net 543, by Calculation from Analysis.

Day and Time. Oct. 24 to 27.	Coal Carbonized. Tons.	Total Gas Made. Cubic Feet.	Gas Made per Ton.	Illuminating Power.	Lbs. of Sperm per Ton.	Calorific Value. Gross B.Th.U.	Calorific Value. Net B.Th.U.	CO_2.	H_2S.
2 p.m. Thursday to 6 a.m. Friday	10·0	109,400	10,940	15·87	595	—	—	2·2	1·1
6 a.m. Friday to 6 a.m. Saturday	14·4	178,800	12,417	15·53	661	579·6	521·7	2·0	1·3
6 a.m. Saturday to 6 a.m. Sunday	13·7	179,100	13,073	15·61	700	603·5	540·7	2·2	1·1
6 a.m. Sunday to 2 p.m. Sunday	4·8	56,700	11,813	16·30	660	615·1	543·2	2·1	1·2
Total	42·9	524,000*	12,214*	15·83†	663†	599·4†	535·2†	2·1	1·1

* Gas measured with CO_2 and H_2S in. † Gas tested with CO_2 in, and according to London regulations.

AUTOMATIC LIGHTING AND EXTINGUISHING OF STREET-LAMPS.

The Rostin System.

ONE thing which was omitted in our review of the display at the Gas Exhibition in Manchester, was the demonstration made with Dr. Rostin's apparatus for automatically lighting and extinguishing street-lamps. We can now rectify the omission.

On various occasions mention has been made of the Rostin apparatus and of the trials that were being made with it in various towns in the United Kingdom and on the Continent; and it can now be said that its success has been abundantly established, and is beyond question. When first we saw the appliance some three years ago, it was evident that the new principle introduced in its construction would give results different from anything that had then been made; but naturally no conclusive opinion could be formed before the apparatus had had an opportunity of proving its value in daily practice. As developments have taken place, however, it has become apparent that the problem of automatically lighting street-lamps by gas pressure has actually been solved, and apart from reports received from the towns where the system has been installed, documents fully confirm our present opinion as to the indisputable success of the apparatus.

As is generally known, the Tottenham and Edmonton Gas Company have taken up the Rostin system, and have at present upwards of 1300 of the appliances in use; and it is known that the pressures in Tottenham are such that no other apparatus has been able to give satisfaction there before. Consequently, it is not surprising that the Company are constantly extending the system. For nearly two years, too, the appliance has been installed in the City of Westminster and part of the area of the Lambeth Borough Council in the district of the Gaslight and Coke Company; and their working there has been under close observation. The result is that it is expected that in a very short time, the Company will be extending the installation by a few thousand lamps.

The financial aspect of the installation of the "Rostin" apparatus is clearly demonstrated by a report that the Borough Surveyor of Tottenham made to the Council. In this he said: "With regard to the 'Rostin' automatic system of lighting and extinguishing public lamps, adopting the figures supplied by the Gas

Company, they effect a saving of 400 hours' lighting for each lamp per annum; and as 800 lamps are so fitted, the saving of gas is equal to £107 17s. 8d. per annum. In addition thereto, as the cost of up-keep and maintenance of each of the lamps referred to is 6s. less than under the old system, a further saving of £240 is effected by the Gas Company. Thus, for the expenditure of £2000, the cost of installing the 'Rostin' system on the 800 lamps, the Company effect a total saving of £347 17s. 8d."

The question is a natural one: What gives the "Rostin" apparatus such a large part of favour in the field of automatic lighting, and how is it that it can work under any conditions of pressure? We are fully satisfied as to the ability of the "Rostin" apparatus to work in districts like that of the Gaslight and Coke Company, where certainly, owing to the extent of area, no special conditions of pressure can be created in the ordinary distribution system. This ability of the appliance to accommodate itself to all situations is due to an entirely new system—new with regard to automatic lighting arrangements—and it gives it its distinctive feature. Its ingenuity and value are acknowledged. The newly-applied system, which has extended so much the field of usefulness, is well known in the gas industry, and has been ever since pressure has been measured. Briefly, it is the principle of the water-gauge, the two arms of which are formed into valves, and act as an inlet and outlet valve to another compartment which holds a bell sealed in mercury. This bell operates an ordinary gas cock with a ratchet wheel—an achievement of the "Rostin" apparatus only—which possesses in working as much power as a lamplighter's hand.

We cannot enter here into the question of the initial price of the apparatus in comparison with other systems, excepting to say this, that though the price is rather more than some of its competitors, in view of the qualities of the appliance the price seems justified. It is strongly built; and, requiring very little in the way of renewals, its life, we are informed, can be guaranteed for twenty years or more. This, in connection with the fact that an installation works with less than ½ per cent. of failures, and certainly requires very little attention, are the reasons why such substantial savings can be effected.

One letter which we have just read on the subject of the use of the apparatus in an English town is from a Borough Surveyor; and it confirms the statements already made. The writer says it has answered extremely well, and has realized the highest expectations. In his opinion, the whole system of street lighting has been revolutionized by its introduction; and it represents a decided improvement on the clumsy system of lighting each lamp separately. These views simply reflect those of other experienced officials of local authorities.

DIFFERENTIAL PRICES FOR GAS.

[Communicated.]

The question as to the advisability of introducing differential prices with a view to encouraging the use of gas for heating has come into prominence during the past few weeks; and it must be admitted that it is a subject which calls for a great deal of careful consideration. Some may short-sightedly condemn a scheme which gives an advantage to a winter consumer at the expense of the regular summer and winter consumer. There is something in this which seems reasonable; but yet there is undoubtedly another side to the question, and one which makes it very plain that the disadvantage above mentioned is more than counter-balanced by the unquestionably more business-like method of varying the sale price of an article to suit its respective competitors. To quote a case in point, it will be remembered that Sir George Livesey, a little more than a year ago, suggested that the price of tar should be varied from 1d. per gallon for sale to road authorities up to no less a figure than 6d. for sale to tar distillers. This idea is certainly based on sound principles, and should be brought to bear upon the question of differential prices for lighting and heating.

Satisfactory gas lighting may now be had on such economical terms, and at so large a reduction on the cost of the same light by electricity, that, speaking generally, a further reduction in the price of gas to the lighting consumer is quite unnecessary. But where gas is being used for heating and for power purposes a different line of argument must be followed. In these cases, competition with solid fuel (coal) for the two first-named purposes, and with electricity and steam for the last-named, is sufficiently severe to warrant the offering of special terms. Most unprejudiced people would admit that while gas-fires may be profitably installed in place of coal-fires where the heating is required at intermittent periods, that for continued use the cost is considerably greater, except in exceptional cases where the item of labour would be an expensive matter.

A search through the Board of Trade returns relating to gas undertakings discloses the fact that while a great number allow a rebate to large consumers and users of gas for motive power, yet comparatively few have deemed the heating field of sufficient importance to receive special treatment. Only some forty undertakings, most of which consist of small concerns working under the disadvantage of supplying high-priced gas, have as yet attempted to develop, by means of discounts, this remunerative side of a gas company's business. On a closer scrutiny of the list, it is noticed that not less than 25 are supplying gas at a price exceeding 3s. 6d. per 1000 cubic feet; so the assumption is that the inducement to institute differential prices is much greater among those concerns which are supplying gas at high prices. Two corporations owning large gas undertakings have alone considered rebates necessary to users of gas for heating purposes. These are Rochdale and Huddersfield, which have respectively reduced their charges per 1000 cubic feet from 2s. 8d. and 2s. 6d., to 2s. and 2s. 1d. The Cork Company allow a rebate of 4d. per 1000 feet on their ordinary price of 3s. 4d. for gas used in stoves amounting to more than 5000 cubic feet per quarter. With the exception of five other undertakings supplying over 100 million cubic feet per annum, the remainder are of small size only. The policy of differential prices has therefore not had sufficient trial to warrant the expression of any conclusive opinion as to its success; but the scope for expansion in this branch of gas consumption is so great that it is important that a fair trial should be given to this policy.

As the existing experience of some forty undertakings that have given this system a trial is available for the purpose of guiding the management of other concerns, it will be interesting to draw out a table showing the proportion of discount allowed by those who must be looked upon as the pioneers of this policy.

Price of Gas.	Average Size of Undertaking. Millions per Annum.	Number Included.	Average Ordinary Price.	Average Heating Price.	Average Discount Per Cent.
5/- and over .	4	5	5·1	4·8	20
4/6 ,, 4/11 . .	15	5	4·7	3·11	15
4/- ,, 4/5 . .	19	9	4·1	3·4	18
3/6 ,, 3/11 . .	23	8	3·8	3·0	17
3/- ,, 3/5 . .	95	9	3·3	2·9	15
2/6 ,, 2/11 . .	336	4	2·8	2·2	17
..	66	40	3·11	3·3	17

In the above table it will be seen that the forty undertakings included have been divided into separate groups, each consisting of concerns which are supplying gas at approximately similar prices. It is significant that the average discount allowed by each group only varies to a comparatively small extent, between 15 per cent. and 20 per cent., which shows a unanimity of opinion quite unlike the variation to be noticed in the differential charges of electrical undertakings. It will be remembered that Professor Lewes expressed the opinion that coal at 18s. per ton was equivalent to gas at 2s. per 1000 cubic feet. It therefore follows that coal at 27s. is equivalent to gas at 3s. Many undertakings on this basis are fortunately in the position to be able to compare very favourably with solid fuel; and it therefore behoves them to draw the attention of the public to the question of heating by gas—offering inducements both in the supply and fixing of stoves, and also in the price of gas when used for this purpose. It is only in this way that people will be induced to give this matter their serious consideration. A reduction in price for heating is of itself insufficient unless it is energetically backed up by a systematic and thorough method of bringing it before the notice of the consumers. Many sound schemes for increasing business have been entirely wasted for want of this necessary thoroughness in following up.

A further inducement would be the adoption of some arrangement whereby the cost of fixing a gas-fire, often amounting to 10s. or 15s., might be paid off by disallowing the rebate till the gas consumed, as shown by the discount meter, amounted to a quantity sufficient to pay off the charge. In connection with this matter of gas heating, much might be done to popularize hot-water circulators to act as companions to gas-cookers. Many people would use the latter to a greater extent in the winter months if the hot-water service could be utilized at the same time without going to the extravagance of using both the kitchen range and the gas-cooker.

A few companies are encouraging the use of these hot-water circulators by offering them for hire; but others seem to have neglected what should eventually prove a profitable source of revenue to gas undertakings. However much a consumer, should he happen to know of them, might desire to instal a circulator, he would naturally think twice before going to the expense of buying one at a cost of £5 or £6. This is, of course, a serious bar to their adoption, and is a matter which calls for attention.

The London and Southern District Junior Gas Association will to-morrow week (the 20th inst.) visit the gas-meter works of Messrs. George Glover and Co., at Royal Avenue, Chelsea. The party will assemble at Sloane Square Station (District Railway) at a quarter to three.

Society of Arts.—The opening meeting of the 154th session of the Society will be held on the 20th inst., when an address will be delivered by Mr. Steuart Colvin Bayley, K.C.S.I., C.I.E., the Vice-President and Chairman of the Council. Among the arrangements for the ordinary meetings to be held after Christmas is a paper by Mr. Clayton Beadle on "The Underground Water Supplies of the Thames Basin;" and Professor Vivian B. Lewes, F.I.C., F.C.S., will deliver a course of four Cantor Lectures on "Fuel and its Future" on the Monday evenings in March.

AMERICAN GAS ENGINEERING PRACTICE.*

A BOOK on the principles and practice of gas manufacture in which the retort-house plays no part will seem odd to the conventional notions of the English gas manager. We have, however, such a volume in the "Handbook of American Gas Engineering Practice," referred to in a preliminary paragraph on Oct. 29 (p. 347). The author is Mr. M. Nisbet-Latta, Member of the American Gas Institute, and also of the Society of Mechanical Engineers.

So far as manufacture is concerned, the book deals only with carburetted water gas, notwithstanding the fact that American gas practice covers both carburetted water gas and coal gas—the proportions being about 70 per cent. and 30 per cent. respectively. The use of coal gas is growing rapidly in the States; recent figures showing that its increase is relatively twice that of carburetted water gas. It is, therefore, strange that Mr. Nisbet-Latta's volume should omit all reference to the subject. It is remarked in the preface that American gas engineers have long "deplored the lack of a work treating with the technology of modern gas supply from a practical standpoint, and framed in such a manner as to constitute a book of reference." The volume under notice is designed to serve this end; the intention evidently being to make it more complete and to include other methods of manufacture in subsequent editions.

It appears that the author "began several years ago the compilation of material which, accumulating and being classified, has taken the shape of the handbook" now issued. There can be no objection to a compilation of this kind, since it serves a good purpose in bringing together a lot of scattered facts which the average gas manager, not in the habit of "indexing," fails to find when wanted. In this case information and data have been culled from many sources; and it is somewhat flattering to our home industry that it should be from English text-books and authorities that they are mainly derived. So much does this suggest similarity of conditions that the prefix of "American" to the title of the book would seem almost unnecessary. The author has not perhaps discriminated sufficiently in the relative importance of his subjects—occasionally discussing fully some points of comparatively little importance, and dealing scantily with others of greater consequence. One is bound also to say that the classification at times is imperfect, and here and there information already given is repeated under a different heading. With some recasting of paragraphs, and the occasional transference from the concluding chapters of tables and data germane to the subject under discussion, contradiction both of matter and figures would have been avoided, and the reader considerably helped in his study. Otherwise, the volume contains useful information and many serviceable hints and suggestions.

The author wastes no time on historical matter, but at once attacks his theme. "The burden of this work will bear upon water gas as manufactured by the Lowe process" is the first sentence; and in less than four or five lines we are in the midst of a terse enumeration of the component parts of the plant required for the operation. So long as nothing is omitted necessary to a full comprehension of the subject, this brevity is commendable. A few pages devoted to a description of the chemical and physical character of the gas to be manufactured would have been, however, of advantage, since the author, busy with working details, says little as to the crude gases which are being evolved and passed forward. He takes for granted that the reader is well acquainted with what is going on. It is sufficient to instance the short chapter on scrubbing, where trays and water are dealt with as having the first heavy duty "in cleaning and purifying;" but no information is given of the impurities to be removed. The names would have been better than nothing. Unfortunately, no illustration is given of a carburetted water-gas apparatus, although the book is not without illustrations of much less importance. Its absence will be felt by many a student who is not acquainted with carburetted water-gas manufacture.

Apart from somewhat insufficient information of this kind, the reader will, from a perusal of the chapters on carburetted water-gas manufacture, gain useful and necessary knowledge as to the practical working of the plant. These chapters, comprising the first part of the book, deal with the apparatus from the generator to the holder. Such matters as fuel and fuel periodicity, blast pressures, steam supply, oil, clinkering devices, and the like, are severally discussed. Special attention is rightly given to the character, supply, and flow of steam; and the author suggests, as is probable, that the greatest field in the future for the economical production of carburetted water-gas lies along the development of superheated steam. Under the heading of "Carbon Dioxide," the author quotes, without discussion, the analysis of American water gas published in O'Connor's "Pocket Book," and then briefly deals with the production of carbonic oxide and carbonic acid and the effect of carbonic acid upon candle power. He makes a slip when he states that 1 lb. of carbon requires 1·25 lbs. of oxygen to form carbonic oxide. The correct figure of 1·33 lbs. is given at the end of the book.

The generator chapter concludes, and the next chapter begins, with useful hints on fire goods and cement. Some few pages are devoted to the grades and use of oil; but much of this will be already known to English readers, since Butterfield, Leather, Ross and others are the authorities quoted. In passing, it may be noted that the author does not agree with the usual practice of heating gas oil before admission to the carburettor.

Most of the data for scrubbing, condensing, and purifying are quoted from English text-books, although duly acknowledged, and do not therefore call for comment. The chapter on purifiers is a full one; and the subject is dealt with as if referring to both carburetted water gas and coal gas. The author is at fault when he implies that part of the duty of the purifying material is to arrest "tar, oil, and condensation" products. He somewhat corrects this later on by pointing out the bad effects upon oxide resulting from previous imperfect condensation and scrubbing.

A chapter on exhausters and compressors is followed by others on the station meter and the holder. The latter does not deal with constructional matters, but contains useful notes on questions of pressure, preservation, and temporary repairs to holders. With the formulæ and data English readers will be sufficiently acquainted, since their source is evident. Before passing from this section of the book, it is necessary to say that the author would do well in another edition to furnish particulars of fuel, oil, water, &c., required per 1000 cubic feet gas made, and some information as to the approximate cost of manufacture.

It is probably that in distribution greater variety exists between English and American practice, and one therefore turns with expectation to the second part of the book, which deals with this subject. Under the heading of "Mains," the author follows to some extent his previous practice of quoting verbatim from various authorities, as, for instance, the United Gas Improvement Company, of Philadelphia, and the proceedings of the American Gaslight Association. The several excerpts are useful as covering the art of main-laying; but the method, unfortunately, involves some repetition of detail. Fixed flanged joints, bell-and-spigot joints of lead and cement, and ball-and-socket joints are stated to be practically the only ones used in the country. Some interesting, though not exhaustive, particulars and illustrations of high-pressure main laying and jointing are given. In dealing with escapes, Mr. Nisbet-Latta advocates the periodical testing of the whole main system by piercing the ground with a bar along the line of piping. He makes no mention of any device like Ansell's gas-leakage indicator; and he suggests testing first by smell, and then, strange to say, by the application of a match. Costs of installing mains are furnished, and some pages devoted to dimensions and sizes of various main specials. The reader has to turn to the last chapter in the book for further information of mains and main laying, added as if by an afterthought. In the chapter on "Services," dimensions of pipes and connecting fittings, both for low and high pressure, are given. Service pipes of not less than 1¼ inches are advocated.

Consumers' meters are briefly dealt with in the following chapter. If non-reference is any indication, prepayment meters would appear to be unknown in America. It is suggested that all meters should be tested every three years. So comparatively short a period is surely unnecessary in view of the enormous expenditure entailed.

The author then discusses the question of pressure; and under this heading he deals with governors, pressure gauges, including the Pitot tube, and the formulæ for gas discharges under both high and low pressure. It is interesting to note, from the table of "Registration of Gas by Meter at Different Pressures," that on exceeding about 7 inches pressure a meter increasingly registers slow. At 20 inches pressure, for instance, 1·732 cubic feet of gas only registered as 1·675 feet.

Two chapters are devoted to house piping and appliances; and information is given which is likely to be serviceable to all engaged in fitting work. Gas-cookers are dealt with in 11 pages! but incandescent and flat-flame burners are disposed of in two pages each, industrial apparatus in a page-and-a-half, and gas-engines in merely twenty lines. Gas-fires, street lighting, and other matters seem to be forgotten.

Some curious remarks are made under various of these headings. The statement is made, for instance, that the efficiency of gas-cookers and similar appliances "depends entirely" upon the calorific value of the gas, and yet, after suggesting 650 B.Th.U. as constituting a suitable gas, the author, in the same connection, goes on to talk of gas in candles. Again, he states that with blue water gas 19 to 20 candles per cubic foot have been obtained from a special "argand" burner. One remembers that Professor Vivian B. Lewes made this claim; but it was obtained with a Welsbach mantle and a Philadelphian fuel burner. The chapters on gas distribution and supply are, however, very readable, and contain much that is useful and suggestive.

The third and final part of the volume covers general technical data; and here the author has been indefatigable in collecting tables. They cover every conceivable purpose in gas technology, and should prove handy for reference. These chapters treat successively of "Properties of Gases," "Steam," "Mathematical Tables," "Conversion Factors," and "Pipe and Miscellaneous Data." The first of these is interesting, and deals with the subject fairly fully. It is obviously out of the question to check all the data furnished; but slips here and there are noticed. One table giving the analysis of coal gas returns the percentage of carbonic acid as 0·60—evidently a printer's error, but unfortunately not the only one of the kind.

It seems almost a pity to have burdened the volume with the chapter on "Steam," which occupies thirty pages, and is a small

* "A Handbook of American Gas Engineering Practice." By M. Nisbet-Latta. London: Archibald Constable and Co., Limited; 1907.

treatise in itself. The student could easily enough be referred to text-books on the subject. There are other matters in gas engineering practice which would have been much more serviceable. Photometry and candle power are not described, although calorimetry has a short section. Electrolysis also might usefully have had a little attention. These are topics which will probably be dealt with in a subsequent edition. The author, indeed, anticipated some such inclusion, and in the preface frankly invites suggestions and criticism for the purpose of extending the usefulness of the book.

It may be said of the present volume, in any case, that Mr. Nisbet-Latta has brought together a lot of handy data, and written up many practical notes on the actual work of the plant dealt with. The index, unfortunately, is inadequate for the purpose of ready reference.

PROFESSOR VIVIAN B. LEWES ON LIQUID AND GASEOUS FUELS.*

THE volume of 334 pages before us, in which Professor Vivian B. Lewes essays to treat the important subject of liquid and gaseous fuels from a popular but comprehensive point of view, forms one of Messrs. Constable's "Westminster" series of handbooks. The work is not intended to take the place with the student of the recognized works of reference on the subject, but rather to give a general sketch of the whole of it and its bearings on the power problems of the day.

It has seldom been our lot to read a technical work in which the author has so well fulfilled his confessed aim; and we offer our congratulations to Professor Lewes on the successful issue of his task. The popular nature of the book has allowed him scope for the employment of the narrative style with which he knows so well how to charm the reader. Once the volume is taken up, it will not readily be put aside until it has been read through; for the author succeeds beyond expectation in rousing the interest and compelling the attention of his student. The high level of the author's style is pretty uniformly maintained throughout; and it is by contrast with it that a few faulty passages jar, as, for instance, a single sentence on page 127, which runs to thirteen lines punctuated by only six commas.

The first three chapters deal with combustion and the part played in it by the atmosphere, the formation of fuel in its various forms, and the methods of determining calorific value. Much of this part of the work is quite elementary; but probably the author is wise not to assume that all his students have had a training in chemistry. The subjects are nevertheless handled so well that even the more elementary passages may claim the interest of all. In a book of this character there are necessarily omissions; and in some cases omissions become almost as misleading as misstatements. On the whole, Professor Lewes's wide experience as a teacher and lecturer has enabled him to avoid this pitfall of the writer of popular or semi-popular handbooks. But when he is called upon to revise the present text, he should remove the impression which he now gives, on page 35, that "choke-damp" in mines is necessarily the result of explosions of fire-damp. It is, of course, also of common occurrence in coal mines and workings in which no explosions of fire-damp have taken place, and is found in other mines in which fire-damp is never present.

The next two chapters treat of oil and its use as fuel. Oil in this connection is ordinarily synonymous with petroleum; but shale oil, coal tar, creosote oil, and blast-furnace oil are also properly referred to. Incidentally the author points out that the world's utmost possible output of oil would be quite inadequate to take the place of the coal now consumed as fuel, and that therefore oil has necessarily only a restricted field of application as compared with coal and its products coke and gas. Then follow two chapters on coal gas, on which topic, of course, Professor Lewes is at his best. There are tables and a diagram showing the relations subsisting between the candle power and the calorific power of coal gas and carburetted water gas. These should prove useful; but we notice that the candle power is derived from the "16-candle rate," which, of course, means the use of the "London" argand burner No. 1, which to all intents and purposes is now obsolete as an instrument for determining the candle power of gas. From other references in the book, we may conclude that it was written before the introduction of the "Metropolitan" argand burner No. 2, and the Boys calorimeter —*i.e.*, before January, 1906. Professor Lewes admits that some of the matter utilized by him in the book has appeared before in lectures and papers given by him; but he states that where this is the case, it has been brought up to date. In the instance cited, this is scarcely correct.

Next follow chapters on water gas and producer gases, including Mond gas. Some reference is made to the South Staffordshire Mond gas scheme, but rather to the intentions of its promoters than to what has in fact been accomplished. Here, again, we fancy the author has let what he probably penned a year or two ago stand unaltered. The tenth and final chapter is devoted to a general comparison of available fuels, and a discussion of the fuel supply of the future. When coal and oil supplies are exhausted, peat and alcohol will absorb attention. According to Professor Lewes, "it is (? to) alcohol, and alcohol alone, to which posterity will have to turn for a fuel; and the sooner this fact is recognized, and the full force of experiment is turned on to the problems of the alcohol motor, the better." Perhaps so; but has Professor Lewes considered how small an area on the world's surface its then inhabitants will be prepared to spare for the growth of potatoes for the production of alcohol, unless indeed by that date alcohol has become as much esteemed as a food as he would have us esteem it as a fuel?

* "Liquid and Gaseous Fuels, and the Part they Play in Modern Power Production." By Vivian B. Lewes, F.I.C., F.C.S., &c., Professor of Chemistry at the Royal Naval College, Greenwich; Chief Superintending Gas Examiner to the Corporation of the City of London; Associate Member of the Council of the Institute of Naval Architects, &c., &c. London: Archibald Constable and Co., Limited; 1907.

WATER ACTS FOR 1907.

IN preceding issues of the "JOURNAL," we have noticed the principal features of the Gas Acts of the past session. We now deal with the measures relating to the supply of water, taking first those promoted by Companies.

The Colne Valley Water Act confers power upon the Colne Valley Water Company to raise additional capital to an amount not exceeding £240,000, including premiums, by shares or stock; the former to be of not less nominal value than £10, and the dividend to be limited to 7 per cent. if the capital is issued as ordinary, and to 4 per cent. if as preference. The new capital is to be offered by auction or tender; and one of the conditions of sale is that the full price, including premium, is to be paid within three months after the sale. Shares or stock not sold may be offered to the shareholders, employees, or consumers. The Company may borrow to the extent of one-fourth of the amount of additional capital authorized, and also create and issue debenture stock subject to the provisions of the Companies' Clauses Act, 1863, and section 43 of the Company's own Act of 1885. The Act contains some extended provisions in regard to the charges for the supply of water for domestic purposes. The present scale is to remain in force in the portion of the parish of Harrow-on-the-Hill included within the urban district of Harrow until Dec. 31, 1908, after which it will be modified in certain respects, and continue until Dec. 31, 1913. Then another scale, applicable throughout the whole of the district within the Company's limits of supply, will come into force. As from Jan. 1, 1909, the supply of water to boarding houses and schools in Harrow is to be by measure, at prices ranging from 1s. 4d. down to 10d. per 1000 gallons, according to the quarterly consumption; the minimum charge to be 10s. After the date named, the Company are not to be compelled to afford a supply of water for ordinary domestic purposes for less than 8s. 8d. in any one year; the charge for supplies by meter to be 9d. per 1000 gallons, exclusive of meter-rent. Water supplied by measure for other than domestic purposes is to be charged for according to a scale contained in a schedule to the Act; and the Company are not to be required to give or continue such supply for less than 10s. (exclusive of meter-rent) for any quarter or portion of one. The Act contains provisions for the protection of the Middlesex and also the Hertfordshire County Council and the Hendon Urban District Council. With regard to the two former, it is specified that mains are to be laid, where practicable, at such a depth that there shall be not less than 3 feet between the top of the pipe and the surface of the ground. The Company are not to sink any new well upon any lands, or construct new works for taking or intercepting water from them, unless such wells, works, and lands are specified in a future Act of Parliament; but this provision is not to apply to the completion of the wells and works at Bushey and Eastbury. Subject to the approval of the shareholders in general meeting, the Directors may grant pensions and retiring or superannuation allowances to their officers and servants, and may, on the Company's land, provide and let cottages and buildings for their accommodation. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Great Yarmouth Water-Works and Lowestoft Water and Gas Act authorizes the construction of additional water-works and the taking of water from the River Bure, for the purpose of affording increased supplies by the Great Yarmouth Water Company and the Lowestoft Water and Gas Company, and confers further powers upon these Companies with reference to their respective undertakings. The additional works sanctioned are in the main those for which powers were unsuccessfully sought in the session of 1906. They consist of an intake on the above-named river in the parish of Horning, a line of pipes connecting it with a subsidiary reservoir in the parish of Ormesby St. Michael, a pumping-station near the intake, and another pipe-line from the reservoir to the pumping-station of the Great Yarmouth Company. The water is not to be drawn from any other part of the river than the point of intake; nor is it to be taken for the purpose of supply if it contains more than 20 grains of chlorine per gallon. Contravention of this provision will render the Company liable to a penalty not exceeding £10 a day. No water taken from the Bure is to be distributed unless it has been drawn from a subsiding reservoir or reservoirs having a total capacity equivalent to not less than nine times the maximum quantity of water so abstracted in any one day, and has been effectually filtered. In the event of contravention of this section, the Company will be liable to a similar penalty to that just named. In the Bill, the

reservoir capacity was put at five times the maximum daily abstraction of water. The periods of three years for the compulsory purchase of land and seven years for completing the works stand as in the Bill. The Act contains a number of provisions for the protection of the Norfolk County Council, the Great Yarmouth Port and Haven Commissioners, the Ludham Drainage Commissioners, and the Bishop of Norwich. The Company are not to abstract any water whatever from the 15th of July to the 31st of August, both days inclusive; nor may they take more than 3 million gallons a day in the months of June and September, and during the first fourteen days of the month of July, and not more than 4 million gallons a day in the other months. Ample provision is made in the Act for preventing the pollution of the river. The two Companies concerned may supply each other with water and sell it in bulk; and the Lowestoft Company are empowered to supply it by measure at a price not exceeding 2s. per 1000 gallons. They may raise additional capital to the amount of £120,000, and the Great Yarmouth Company to the extent of £80,000, the dividend to be limited to 7 per cent. on ordinary and 6 per cent. on preference capital. It is to be put up to auction or tender; and any stock or shares not sold are to be offered to shareholders. Borrowing powers to the extent of one-third of the additional capital are granted; and authority is given to create debenture stock. The Great Yarmouth Company are to supply water for all Government purposes on conditions to be agreed upon or determined by an arbitrator, and they are not to commence works below high-water mark without the consent of the Board of Trade. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Portishead District Water Act confers on the Portishead District Water Company power to construct additional works, consisting of a pumping-station in the parish and urban district of Portishead, a covered service reservoir in the parish of North Weston, and a line of pipes connecting them, all of which are to be completed within seven years from the passing of the Act. Provisions are included for the detection and prevention of waste and pollution, the sale of water by measure, and its supply to houses partly used for trade. The charge for water sold by measure is not to exceed 2s. per 1000 gallons for ordinary, and 1s. per 1000 gallons for public purposes. Authority is given to raise additional capital to the nominal amount of £24,000, including premium, the dividend on which is limited to 7 or 5 per cent., according as the capital is issued as ordinary or preference. It is, as is now usual, to be put up to auction or tender, and any not sold is to be offered to the stockholders, employees, or consumers. Borrowing powers to the extent of one-third of the additional capital are granted, and debenture stock may be created. [*Parliamentary Agents: Messrs. Batten, Proffitt, and Scott.*]

The Selsey Water Act incorporates a Company for the supply of water in certain parishes in the county of Sussex. The Bill as introduced contained provisions for the supply of gas; but they were withdrawn, for reasons which were dealt with when the measure was passing through Parliament. The capital of the Company is £15,000, in £10 shares; and borrowing powers to the extent of one-third are granted, but they are only to be exercised as directed in the Act. Debenture stock may be created. In the Bill as promoted, authority was sought to construct a well and pumping-station and carry out other works; but these have been dropped, and the Company will be supplied by water in bulk by the Chichester Corporation, under an agreement which is scheduled to the Act. By this the Company undertake to lay a line of pipes, provide a water tower or service reservoir at or near the town of Selsey, and pay 6d. per 1000 gallons for the water, up to an average of 100,000 gallons a day, and a price not exceeding this for any excess quantity. The Company's limits of supply are to be the parishes of Selsey, Sidlesham, Hunston, and North Mundham; but they are not to supply water in any part of the last-named parish without the consent in writing of the Bognor Water Company. The charges for water for domestic purposes are to be based on the rateable value of the premises supplied; and where the supply is by meter, for other than domestic purposes, the maximum rate is to be 2s. per 1000 gallons. In the section of the Act containing provisions for the protection of the Westhampnett Rural District Council, it is specified that the charge for water for public purposes is not to exceed 1s. per 1000 gallons. The Company are not to supply water to any of the property of Selsey-on-Sea, Limited, without their consent; and if that Company promote a Bill next session to enable them to furnish a supply, the newly incorporated Company are not to oppose, except for the purpose of obtaining the necessary protection for their pipes and other works. The Act contains the usual provisions in regard to the sale of water in bulk beyond the limits, the making of bye-laws for the prevention of waste, the supply of materials, the removal of meters, fittings, &c. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Southend Water Works Act empowers the Southend Water Company to extend their limits of supply, authorizes the transfer to them of the water undertakings of the Leigh-on-Sea Urban District Council and the Billericay Rural District Council, and sanctions the raising of additional capital. The extended limits include the parish and urban district of Leigh-on-Sea, and a number of parishes in the rural district of Billericay; and the provision of the Company's Act of 1879 in regard to the supply of a part only of premises is not to apply within the extended limits. The undertaking transferred by the Act consists of a well and pumping-station, buildings, machinery, fittings, and reservoirs at Leigh, and all the mains, pipes, meters, and other plant in connection with the works, in use by, and belonging to, the Council on Aug. 1, 1906. The price to be paid is named as £14,415 12s. 7d. Certain wells and plant specified are to be retained by the Council. All mains laid or machinery fixed with the approval of the Company's Managing-Director between the above-named date and the day of the transfer, are to be paid for in addition. The Company take over the loan indebtedness of the Council, and retain as much of the purchase-money as is necessary to pay it off. The property of the Billericay Rural District Council consists of about an acre of land, with the boring and the buildings, machinery, and fittings upon it; and the Company will pay £2300 for the whole. The Council are, however, to have the option of retaining any rights now possessed by them, under agreements with the Company, for the supply of water in bulk to certain parishes named in the Act. Provision is made for securing the water from the boring for use primarily within the Council's district; and the quantities to be guaranteed per day per head of the estimated population are specified. The Council are to pay at the rate of 1s. 6d. per 1000 gallons for the water they require, and an annual rent of 30s. for each meter supplied by the Company. Authority is given for raising additional capital to the amount, including premiums, of £250,000, in £10 shares, and carrying a maximum dividend of 5 per cent. per annum, whether issued as ordinary or as preference capital. It is to be put up to auction or tender, and any not sold is to be offered to the shareholders. Borrowing powers to the extent of one-third of the additional capital are granted; and the Company may create and issue debenture stock. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

By the Wisbech Water Act, the limits of supply of the Wisbech Water Company are extended and further powers are conferred. Under the Act, about twenty parishes in the county of Norfolk and half-a-dozen in the Isle of Ely are brought within the Company's area. This extension necessitates the construction of additional works, for which authority is given. They consist of an aqueduct, conduit, or pipe-line from one boundary of the Company's district to another. Permission is given to raise additional capital to the amount, including premiums, of £30,000. It is to be sold by auction or tender, and any not disposed of in this way may be offered to the holders of ordinary shares or stock or to the employees of the Company. The additional capital is to be entitled to 7 per cent. dividend if issued as ordinary, or 6 per cent. if as preference; and borrowing powers to the extent of one-third are granted. [*Parliamentary Agents: Messrs. Dyson and Co.*]

AN INVESTMENT NOT TO BE ENTERTAINED.

The Water and Gas Debenture and Share Investment Trust, Limited, are recommending as an investment the shares of the Rawcliffe (Yorks.) Gas and Coke Company. This is a new Company which is offering to the public 700 6½ per cent. £5 Preference shares and 700 £5 ordinary shares. Nearly three years ago, the Gas and Water Works Supplies and Construction Company entered into an agreement to lease the gas-works and premises at a rental of £50 per annum, with the option of purchasing the freehold works and premises for £1000. Their interest in this agreement has now been sold to the promoters—the Water-Works Lighting, and Power Investment Corporation, for £500. The promoters—in consideration of the payment of £2800 in cash and an allotment of 140 fully-paid shares (equivalent to the par value of £700) in the Rawcliffe Gas Company—undertake to carry out "certain improvements to the existing works and provide and lay a further trunk main to the outskirts," in addition to handing over their interest in the above-mentioned agreement. The promoters are, moreover, to receive a sum not exceeding £800 to defray promotion expenses. It will thus be seen that a large proportion of the £7000 offered to the public will be retained by the Water-Works, Lighting, and Power Investment Corporation in consideration of certain work, the extent and cost of which is not disclosed. It should, however, be mentioned that the vendors guarantee to provide a sum which, together with the profits, shall enable a dividend of not less than 4 per cent. for at least two years to be paid on the shares subscribed in this issue.

It is noticed that no details as to past earnings or the quantity of gas sold are included in the prospectus; but the concern is referred to as "an old-established undertaking in good working order and revenue earning," and "it is fully expected that the revenue from the available and possible customers obtainable on the new extensions will within a short time produce with the present revenue sufficient to pay an increasing dividend on the ordinary shares allotted on this issue in addition to the 6½ per cent. dividend on the preference shares." The entire absence of data as to the past history of the undertaking lays the prospectus open to being fairly described as vague and unsatisfactory.

Rawcliffe boasts of a population of only 2000 inhabitants, and much expansion must be seen before the sales of gas will be sufficiently extensive to show enough profit to pay anything like satisfactory dividends. There are several other points in the prospectus to which exception might be taken; but sufficient have been mentioned for the opinion to be expressed that, before confidence can be inspired, fuller information must be forthcoming and moderation in the promoters' demands must be apparent.

GAS SUPPLY AND GAS-FIRES.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The tone of the recent discussion and comments in your columns anent the gas heating question, is to the effect that gas engineers as a body have not been in the past, and are not in the present, fully alive to the merits of the gas-fire, as an agent for improving the position of the industry, increasing profits, and reducing selling prices—that while they have gone in heavily for incandescent light, cookers, engines, and appliances for special technical purposes, they have not done much for the gas-fire. Even under the present unfavourable circumstances, it is admitted that the heating department is an important item in the total of gas consumption; but it is said to be in a stunted, dwarfed condition, whereas with proper cultivation the quantity of gas used by this means would more than exceed all the other uses put together. It is pointed out that in place of the short period, intermittent use that constitutes the bulk of the business at present, there might be a steady and regular demand. To secure this result they must not rest satisfied with the ideas of hire, hire purchase, sale at cost, and assistance in fitting up that at present constitute the blandishments offered to the prospective user, but move forward with a decided big step in the direction of differential prices or some other special inducement. The end in view, I take it, is to secure something approaching universal adoption of gas, instead of coal for the ordinary domestic hearth.

The subject is especially deserving of the fullest possible consideration in all its bearings, at the present time, because more than one reason might be given for anticipating a very considerable extension in this department, apart from any action that may be taken up by the suppliers of gas. I am free to confess that if the gas engineer has neglected the gas-fire, the maker has not done so, and that the improvements effected in its construction year by year are very decided evidence of ability and enterprise. Every detail has been refined again and again; and the appliance has now reached such a position in respect to efficient action, appearance, and cost, that it is difficult to account for the comparatively small proportion of gas-fires, as compared with the number of consumers, that are actually in use. When one can obtain, from the gas offices, or any ironmonger's shop, at a price not greatly exceeding a guinea, an article that is an embellishment to any drawing-room, that yields a genuine cheerful heat, not a mere rosy coloured light, is capable of maintaining, for the greater part of the year at any rate, a comfortable living temperature in a room up to 15 feet square in size, at a cost of about ½d. per hour for gas, and secures all the advantages incidental to the gaseous form of fuel, the wonder is that the appliance does not recommend itself, and secure large sales. And it would do so but for the general unfamiliarity, on the part of the public, with the gaseous form of fuel. Even to-day there are architects who scarcely regard the gas-fire as anything more than a sort of scientific curiosity. Apart from the improvement in the gas-fire, there is the general demand for what may be called domestic conveniences—anything that will save trouble. People of both sexes are now engrossed by business or pleasure, and household work is a drudgery that must be cut down as much as possible. Therefore, anything that saves labour is likely to find favour. Somewhat connected with this subject is the servant girl problem, which is becoming acute in many districts, and the public are prepared to welcome anything enabling them to be independent of "Mary Jane," or that will, by reducing work of a menial character, tend to make her more satisfied with her position.

It was not until gas companies themselves took up the question of a proper supply-pipe from the meter, that the use of the gas-cooker became general. Incandescent burners moved slowly until they received the powerful stimulus afforded by competently devised maintenance schemes. If similar attention was accorded to the gas-fire, corresponding results would follow. No one would think of leaving a coal-grate full of dust and ashes all the summer, and then try to commence fires in the winter without removing the refuse. Yet how many people follow the ordinary, common-sense plan, when the first of October comes round, of clearing the accumulated dust and dirt of six months' idleness from the burners of the gas-fire. They light it up when it is wanted, and complain that it makes a "stuffy" smell, which is only to be expected until it has burnt itself clean. The rent charged for a gas-fire should be sufficient to cover the cost of a visit every autumn for the purposes of cleaning and inspection, and such a simple expedient would save many a fire from being thrown out as unsatisfactory. Many of them are improperly fitted up; being just dropped in front of the existing coal-grate, and connected to the nearest gas-pipe. A user of gas is pleased by the appearance of a gas-fire in use that he has seen at some exhibition, at an ironmonger's shop, or at the house of a friend. One or more of a similar character are ordered, and in due course connected up to the existing gas supply, which is possibly, or should I say probably, already loaded up to the last straw. The result is that if the fire is lighted up at any period within the hours of maximum lighting on a winter evening—say between 3 and 10 o'clock—the lighting burners dwindle and flicker, the whole supply is feeble and unsatisfactory, and the gas-fire quite fails to give the bright incandescent glow that originally took the fancy of its present disappointed proprietor. And, if the tradesman who supplied it is sent for, the quality or pressure of the gas supply is declared to be at fault. Now that the schoolmaster is abroad with respect to the user of gas, the necessary conditions for the satisfactory operation of gas-fires, and for that matter any appliance requiring a large supply of gas, cannot be made too clear or too prominent. Given a 10-light gas-meter and a 1-inch diameter service already serving 15 to 20 lights, if a second 20 lights were wanted there would be no question as to the need for a larger service meter. But one often finds two or three gas-fires put on without the slightest appreciation of the need for proper arrangements as to supply. Nor is the gas supply everything. The chimney to be utilized for the removal of the products of combustion from the apartment was not designed for a gas-fire, but for coal. Some skill is called for in regard to the arrangement of the flue connections, respecting which no hard-and-fast rule can be laid down. Some chimneys are structurally unsuitable, and are in fact condensation chambers and not eduction flues. In such cases, it is much better to face the music, and say so, rather than leave the customer to prove the same by practical experience, with the result that he becomes a determined enemy to the gas-fire, and will not have it in his house at any price.

There is not only insufficient supply, and unsuitable environments to contend with, but also careless usage. An enormous quantity of gas is wasted in connection with gas-cookers. One is frequently confronted with figures from quarterly bills which do not tally with the results published by the makers, or shown to be practicable at the cooking demonstration. The reason of this is, not that the meter is wrong, or that the experimentalist or lecturer has overstated the case. But when making efficiency tests it is not usual to leave gas burning when it is not wanted, or to utilize the flame rather for the destruction of the kettles or saucepans than for heating the contents. Yet one often sees in actual every-day practice a boiling ring flaring away in full blast with nothing on it, or a 6-inch vessel placed on an 8-inch ring, with flames curling up all around. The same applies to the gas-fire, and to a greater degree. The fire may be left full on for hours, and even days, when it is not wanted, or used full-bore when half-cock would answer every purpose, with most unsatisfactory results as regards the quarterly bill next ensuing. I notice that one lecture at Manchester is on "common fallacies." A complete enumeration would occupy half-a-dozen lectures, and one fallacy, which costs the consumer a great deal of money, is the idea that a gas-tap can only be used in two positions, "full on" and "shut." A fuller appreciation of the fact that the tap can be used as a regulator would work wonders.

For another fallacy, the manufacturer of apparatus and the demonstrator are both to some extent responsible, and gas engineers are not wholly innocent. One can scarcely take up a catalogue, a report of a cookery demonstration, or of a lecture on the advantages of gas, without coming across the statement that it is ready at a moment's notice, day or night—that it need not be turned on till it is wanted, and can be dispensed with in a moment. This is all right when not taken literally or without intelligence. Some time ago, there was a discussion in our technical papers over Mr. Newbigging's third "Golden Rule," which really turned on whether the same was to be followed blindly, or according to the dicates of ordinary common sense. But it is no uncommon thing for the consumer to light up the oven the moment before putting in the joint, or to go into a room at 40° or lower, light up the gas-fire, and expect to immediately have a comfortable temperature to sit in. The unsatisfactory results that inevitably follow such stupidity are laid at the door of the appliance or of the gas. To meet this mistake, there is a tendency to put in a larger fire than is really required, which means waste of gas, if nothing worse. The consumer must learn to appreciate the difference between *raising* the temperature and *maintaining* it, and that very often gas may be saved by a low consumption extending over several hours, compared with a big flare up for a few minutes at a time that the room may be actually used. Especially is this the case in rooms with thick walls, or having a sheltered and warm aspect.

A subject of such magnitude and importance as the one now under consideration can be approached or viewed in many different aspects. The utilitarian objects to see valuable constituents poured out to waste through millions of chimney pots, when they might under different circumstances be retained at the gas-works, and made up into saleable commodities. The hygienic enthusiast would like to see similar results, but for quite another reason. Finance is a matter beneath his notice; but he regards the constituents just referred to as being injurious to health, directly and indirectly. The smoke abatement agitator comes up to the same point by a third road, and talks about the effect of soot and sulphur as regards buildings, large or small, furniture, and decorations. Besides these, there is the great question of public convenience. The special advantages incidental to gas supply, which have secured its adoption for so many different purposes, are as applicable to gaseous fuel as to gaseous lighting. Already the interests involved in the manufacture and sale of gas-fires have reached important proportions, and those who have invested capital or brains in the subject could say something from their point of view. And lastly, there is the position of those who supply the gas, who are responsible for maintaining a full and proper pressure in the pipes, and are also expected to show a sufficient balance "available for dividend" in the annual accounts. Most of the various classes above indicated have expressed their views to a greater or less extent; and it is in respect to the last named—the man at the gas-works—that I propose to follow the subject in some detail. The figures quoted are, unless

otherwise stated, something more than mere estimates—being based on actual facts from practical experience. And they can be followed up in respect to any particular undertaking, by substituting the corresponding items from the carbonizing books in place of those given.

It has always been a great point in the view of the gas engineer, to sell gas at the lowest possible cost. His directors evince the liveliest interest in all endeavours to that end, and it is not too much to say that the extent of his success in this direction is regarded as evidence of technical ability. It receives prominent attention not only at the shareholders' meetings, but in the technical press, and a reference thereto is regarded as one of the greatest compliments that can be paid, on the occasion of any public function. Who, in referring to the labours of Sir George Livesey, for example, would omit a reference to the current selling price in the South Metropolitan district? As a natural result, the gas engineer is very keen on any means of reducing the cost of his gas in the holder, and even a trifling matter of a small fraction of a penny per 1000 cubic feet is not beneath his attention. And he has not failed to appreciate the fact that the more work he can take out of his plant, the less will be the charge for interest on capital, per 1000 cubic feet of gas made, and that anything in the direction of day or all-the-year-round consumption—such as a cooker that will be used at regular periods each day or week, or a gas-engine that will run for 12 hours on every working day in the year—is a great assistance to that end. The point can be illustrated by taking out the monthly consumption in terms of the total annual consumption, as is done in the table attached, and by stating the same as nearly as can be ascertained for various classes of consumption. Column 1 is for lighting only, and it compares fairly well with the earliest experiences of gas supply; columns 2 and 3 represent regular day or all-the-year-round consumption; and column 4 shows the result in a gas-works doing a mixed trade of the usual class, for the year 1906. The capabilities of the plant must be equal to maintaining satisfactory results throughout the month of December; and the table does not fully represent the conditions. If the hourly consumption could be compared, it would be seen that, while column 1 was confined to a few hours per day, column 4 was spread out over 16 or 18. Therefore, for the same monthly quantities, a much smaller storage and distribution plant would suffice for column 4 than for column 1. But taking the percentages as they stand, there is a substantial reduction in the winter, and increase in the summer. In place of 20·4 per cent. for the four summer months in column 1, there is 26·1 per cent. in column 4. A much larger annual turnover can be run off the same plant, or in practice the thing works out to increased business without proportionately increased capital; and for this cause alone the amount required to pay interest, and therefore the cost of the gas in the holder or at the consumer's meter, has been reduced to the extent of 6d. or 9d. per 1000 cubic feet.

Month.	(1) Lighting.	(2) Cooking.	(3) Motive Power.	(4) Average.	(5) Heating.	(6) Monthly Percentages.
January	12·1	8·3	8·3	10·5	20	17·5
February	9·6	(Fairly even.) (Rather higher during summer.)	(Fairly even.)	8·5	17	15·0
March	8·6			8·3	13	11·8
April	6·5			7·2	..	1·8
May	5·0			6·6	..	1·7
June	3·8			6·1	..	1·6
July	4·2			6·4	..	1·7
August	7·4			7·0	..	1·8
September	7·8			7·8	..	2·0
October	10·3			9·3	13	12·0
November	11·7			10·4	17	15·3
December	13·0			11·9	20	17·8
	100·0	..	..	100·0	100	100·0
Total annual consumption in millions	60	..	..	120	250	370

The gas engineer has also been greatly assisted in his endeavour by the fact that the consumption for the purposes indicated in the first three columns follows a regular rule, and the requirements for any one month can be forecast two or three months ahead, with sufficient accuracy for all practical purposes. The lighting follows the hours of daylight and darkness; the other uses take up regular variation according to established local custom. Any fluctuation, due to stress of weather or other unforeseen cause, is well within control. It rarely extends over 10 per cent., and can be taken care of by the aid of reasonably moderate storage capacity. So the figures in columns 1 to 3 fairly represent one year with another. This fact is of considerable importance. New retorts require at least three days to get into proper working order, and their erection is a matter of several weeks. So an uncertain demand, ranging up to 100 per cent. instead of 10, would necessitate a very large reserve of retorts, and much larger storage.

The practical gas man has long ago recognized that the gas-fire offers no advantages of this character that will aid him in the direction of cheap gas. The only point that can be urged in its favour is that it will use a lot of gas. If this could be coupled up to a regular all the year round consumption, or to a steady demand at any one period, there might be hopes that the gas-fire would increase the turnover per unit of plant and reduce the cost of gas. But the only thing certain about it is that it will not be used at all, or very little, during the six summer months; and in the winter its use will fluctuate widely according to the prevalent temperatures, which in our climate do not follow any regular rule. The temperatures during the winter of 1905-6 were very different from those in 1906-7. In the climate usual to the South of England, there will be, at any time during the winter months, cold snaps, ranging from two or three days to a month or six weeks in duration. At these periods, and at no other, will the gas-fire be going full swing. I do not write without some practical experience—having used gas-fires in house and office for the last 30 years. They are occasionally in demand for an hour or two during the period that is usually described as the summer, but to such a slight extent that they need not really be taken into calculation.

The consumption indicated by column 4 will include a fair sprinkling of gas-fires and warming appliances of all sorts and sizes, and for the most part under occasional or intermittent use, and they are responsible for irregularities in the rate of consumption which follow variations of temperature. It is the general experience that, with sudden frost, or reduction in atmospheric temperature, the consumption of gas goes up 10 or 20 per cent. As already remarked, this causes no inconvenience, but it must not be forgotten that we are contemplating a new condition of things, in which the gas-fire consumption will constitute two-thirds or so of the whole. It is easy to conceive that, under such circumstances, the variations just instanced, might increase to unmanageable proportions, and that before approaching that limit, a point would be reached when some increase in working costs would be necessitated.

In an ordinary district of 4000 middle-class consumers, the average consumption per consumer under the conditions indicated in column 4 will be in the neighbourhood of 30,000 cubic feet per annum. The total annual consumption will be 120 million cubic feet, the maximum day's output 600,000 cubic feet, and the maximum hour's output 75,000 cubic feet. The capacity of the works and distributing plant must be equal to the maximum.

Now let us suppose that the engineer has diligently read up his "JOURNAL," and has so far conducted a campaign on behalf of the gas-fire that its universal adoption in place of coal is assured. Under such circumstances, we may credit each consumer with two gas-fires, which will be in use (but not necessarily full on) during the 150 days or so in the year that artificial warmth is called for. So far we have been dealing with the results of practical experience, but now we are venturing upon speculation. The fires will be provided with duplex taps or other device, enabling the consumption to be controlled within a ratio of something like 1 : 3, for a strong tenet in the new creed will be the importance of strict attention to the avoidance of waste. Or it may not be out of reason to suggest that a thermostat will be introduced, that will attend to this matter automatically, and can be set to any temperature between 50° and 70°—and thus avoid the waste of heat common to coal-fires, which are given to flaring up fiercely in mild weather, and smouldering sluggishly in damp, foggy weather when warmth and cheerful appearance are required. As the fire must be equal to the conditions of the coldest weather, the consumption when full on must not be less than 25 cubic feet per hour. The 15 cubic feet fire is all very well from a financial point of view, and also, as will presently be seen, for the gas company; but who would care to be dependent upon it when the thermometer is below freezing-point? For we must not forget that the consumer will have burnt his boats so far as the coal merchant is concerned. That at present indispensable member of society, like Othello, will have found his occupation gone, and will have diverted his energies and abilities into another channel.

We have to add to the consumption already instanced some 8000 gas-fires, representing a maximum consumption of 200,000 cubic feet per hour, or nearly 2½ millions per day. Taking the annual consumption as 150 days, at an average of two-thirds full capacity, we arrive at 250 millions per annum. The annual consumption is increased threefold; the maximum hourly consumption fourfold; and the maximum day consumption fivefold. If we assume that the cold follows the shortening of the days (a much more regular and therefore favourable condition than could be expected), we shall get the percentages shown in column 5. Column 6 shows the monthly percentages when 4 and 5 are added together. So far from increasing the turnover in proportion to the capacity of the plant, it goes back far beyond column 1. No less than 35 per cent. of the total is required during two months of the year, and only 10 per cent. during the summer six months. The interest on the increased proportion of idle capital must be met by an increased charge on each 1000 cubic feet; and it would not be possible to maintain present selling prices and rates of dividends. Any advantage secured by making 370 millions a year, instead of 120, is more than covered by the irregular demand in respect to the new business. It is proved by actual practice that a certain amount of heating business can be comfortably taken under the wing of the other lines of supply; and I have not heard of any instance in which these limits have been exceeded. But it is evident that directly we approach anything like a universal use of a gaseous fuel, a new condition of things is set up.

The established systems of manufacture, storage, and distribution are not capable of dealing with variations in demand to the extent above indicated. To meet them efficiently, there must in

fact be a new lock, stock, and barrel. The bed of retorts, requiring not less than three days to get into working order, standing cold, and having a narrow limit of economic working—we cannot vary the make per retort per day to a great extent one way or the other, without a serious effect on the manufacturing costs—must give way to a producer that is cheap in first cost, and that has a wide limit of variation in the rates of production, adjustable at an hour's notice, and without prejudice to the working costs. I attach the primary importance to this, because the gasholders and trunk mains, which form the principal features of the distributing plan, have already taken up unwieldy proportions, and we cannot contemplate a five-fold enlargement in that department, quite apart from financial reasons. It would be necessary during these periods of maximum consumption to considerably revise current ideas as to what constitutes a sufficient supply pressure, and mechanical aid would be indispensable.

The usual trend of ideas, in connection with the extension of gaseous fuel, runs in the direction of "cheap" gas of considerably lower calorific value than is now supplied. The above calculations are based on 600 B.T.U. gas; and if it is difficult to practically deal with and distribute 370 millions a year, it would be still more so to deal with a larger quantity. I do not think that the advent of the age of gaseous fuel is going to be hastened by the aid of 300 B.T.U. gas, which costs as much to store and to distribute as 600 or 900 B.T.U. gas. It seems more reasonable to look in the other direction. Gas of 800 or 900 B.T.U. may cost more in the holder, but less at the meter, per 1000 units of heat. Improvements in the efficiency of the gas-fire would aid in two ways—by cheapening the cost to the consumer, and facilitating storage and distribution by reducing the quantity to be dealt with.

While not objecting to an extension of the gas-fire business within economical limits, upon existing lines, I cannot see that, under present circumstances, there is anything to be gained by resorting to differential prices or other powerful stimulants. The differential price is not very extensively adopted in the case of day or all-the-year-round business, though it can be argued, with some show of reason, that gas can be made and supplied at a lower first cost under such circumstances than for lighting or heating. Much of the present gas-fire business is of a day character; but in universal usage some of this advantage would be lost, and the fires would be required at full swing throughout the whole of the winter evenings, and would overlap the other uses more than at present.

HANDLING PURIFYING MATERIAL.

DURING the five or six years that M. Payet has filled the post of Secretary to the Société Technique de l'Industrie du Gaz en France, he has not only proved himself an able and active organizer of all that concerns the French Gas Society's affairs and meetings, but has also shown corresponding engineering activity in contributing several papers to their technical proceedings. Our columns have at various times given translations of these papers; and we have recorded more than once that M. Payet has been successful in obtaining the prizes offered by the Société Technique annually for the best technical contributions to their proceedings.

At a meeting held last month of the Société des Ingénieurs Civils de France, M. Payet read a paper on "The Handling of Purifying Material in Gas-Works," of which we are now able to give a short account, and also an illustration of a special arrangement which he has designed. It was quite fitting that, while the presidential chair of the Society of French Civil Engineers was occupied by a gas engineer, M. Cornuault, there should be at least one paper on a gas subject. It was equally fitting that that paper should be by M. Payet. It must not be forgotten, however, that his audience in the Rue Blanche was not composed of gas specialists; but, like our own Institution of Civil Engineers, it embraced all grades and departments of engineers and engineering. For this reason, the paper contains many things that would otherwise be taken for granted; and, moreover, has of necessity to deal in general terms with points that, under other circumstances, would be treated in much greater detail. We gather that it is M. Payet's intention to give effect to this enlarging or detailing of the paper in a subsequent one which will be read, very likely, before next year's meeting of the Société Technique du Gaz.

After describing the various methods adopted for effecting the chemical purification of coal gas, the present almost universal adoption, both in France and abroad, of oxide of iron is noted. Its great advantages are that it can abstract all the obnoxious impurities from the gas, and that it can be easily revivified by exposure to the air. The form in which it can be used may be either that of natural oxide, or artificial like Lux material, or in a mixture, as in Laming material, which is made by incorporating sawdust, to serve as a carrier or separator with the product resulting from lime acting on sulphate of iron. The purifier boxes in which the material, of whatever character, is placed, are, except until quite recently, of the same form and dimensions as they were in the early days of the gas industry, although then no one thought of mechanical means of handling material.

So, too, the same early principle of three boxes in service and one at rest, controlled by a series of valves or a centre-valve, is still in vogue, justified since the rise of the cyanide industry, by the interest there is to extract the cyanogen from the gas. After revivification, the material from the first box is charged with Prussian blue, the second with sulphur, and the third serves as a catch-box. Various inventors have brought out processes to recover the cyanogen before the gas reaches the purifier boxes, so as to prolong the working of the latter. With a similar object in view, or to reduce the labour, it has been proposed to revivify the material *in situ*, either continuously or when out of action. But in any case, practice has proved that the filling and emptying of purifier boxes are inevitable operations, though more or less frequent. Under these circumstances, the adoption of mechanical means of handling, which under ordinary conditions, for a single purifier-house, would not be economical, is rendered obligatory by other and general considerations. Methods must vary with the importance of the works, and according as to whether it is an alteration to existing plant, or an entirely new installation that is being carried out. The revivifying area may be either (1) on the same level as the boxes; or (2) on a floor below; or (3) on a floor above them.

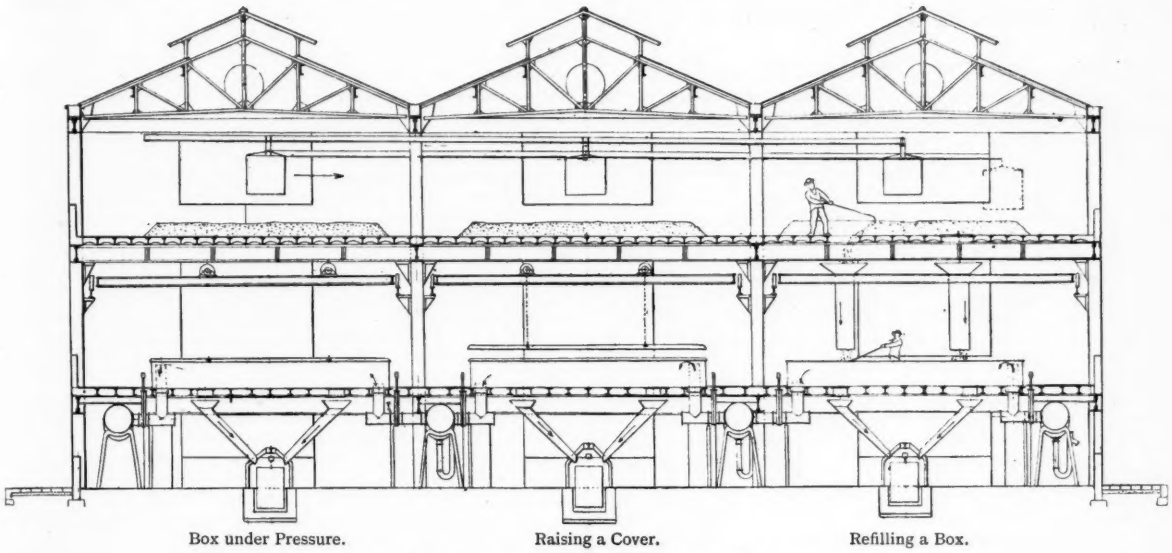
Before dealing with these three types, M. Payet referred to the advantages leading to improved conditions of working and lengthened service accruing from the adoption of special grids such as the "Bamag" and "Jäger." In addition, they divide the material into small portions which can be withdrawn one by one; and shovelling, when emptying a box, is avoided.

As an illustration of the first class, the purifier house at Landy Gas-Works is taken, where the boxes are in two lines parallel to the side walls, in which are openings corresponding to the widths of the purifiers. The early method of manipulating the material by hand in the usual way was improved upon by adopting a system of skips running above the boxes on one of the rails serving the cover-lifting apparatus. Beyond the purifier house—that is, in the revivifying shed—the skips were carried on two-wheeled carriages. By these simple means the cost of emptying and filling the purifiers was reduced by almost one-third. Instead of the carriages in the revivification shed, overhead rails can be profitably used, as at the Schlieren Gas-Works, Zurich.

The second type of arrangement, where the purifiers are overhead, is a more modern one. The boxes are emptied through the bottom. Such are the recent installations at Versailles, and at the Bacalan works at Bordeaux. At the former works, the revivified material is lifted by elevator buckets to tip-waggons running on a raised path alongside the boxes, into which the oxide is tipped. At the Bacalan works, the elevator discharges into hoppers carried by the lifting apparatus for the covers; and thus the material falls directly into the purifiers.

Still more modern than the second type is the third, in which there are two raised floors; the lower being for the purifier boxes, and the top one for revivification or manipulation. There is apparently at present only one such installation in France—that at the Nanterre Gas-Works, belonging to the Union des Gaz Company. [This unique and interesting plant was fully described and illustrated in the "JOURNAL," Vol. LXXXVII., p. 174, July 19, 1904.] It may here be briefly said that the boxes are so arranged that their discharge openings are in a line with two endless chains of gravity bucket conveyors, which run in troughs underneath the ground floor, then up at the end of the house, and along the top floor, upon which at any desired point the buckets can be made to discharge their material. Openings in the top floor allow the oxide to be shot direct into the boxes underneath. M. Payet mentions three proposed schemes designed by a French firm on similar lines to the Nanterre arrangement. In two of them the purifying material is carried in skips supported, in one instance, by wire-rope, and, in the other, by a travelling crane. In the third case, the skips run on mono rails, leading to an elevator boot. The material is then elevated to the top storey, where it is dealt with by another set of skips on mono rails. The great advantage of both filling and emptying purifiers by gravity is that the labour is reduced to a minimum. The danger is that such installations may be complicated and involve heavy capital charges.

M. Payet has endeavoured to retain the advantages while excluding the risks of such installations, in a design he has prepared for a purification plant to deal with 100,000 cubic metres (about 3,530,000 cubic feet) of gas per day. Before describing this, however, he draws attention to the fact that, though it may be advantageous to have boxes of large dimensions, both for reducing the first cost and the expense of working, yet this must not be exaggerated so as to set up too sharp changes, either in gas pressure or in purifying value of material, when altering the working or shutting off a purifier. There should be a studied proportion in, and a very careful consideration of, the matter—according to the purifying value of the material, the amount of gas made, and the probable number of boxes to be changed per day. The arrangement proposed by M. Payet, which is shown in the accompanying illustration reproducing part of his design, consists in a series of skips which are filled from the underside of the purifiers. The skips run on mono rails set at a gentle incline. A lift raises them to the top floor of the purifier shed, where they connect with a second system of mono rails, placed at an opposite incline to that of the rails above the ground floor. A second lift returns the skips from the top floor to the bottom. The entrance of the skips into the lifts, the setting in motion of the lifts, the stopping and starting of the skips, are all done automatically. These appliances have been worked out by a well-known firm; but details



Cross-Section of Purifier-House, with Revivifying Floor above.

of them are not at present available. The plant has been designed so as to be driven electrically, as the gas-works for which it is intended have a central station; but it is stated that the lifts could work hydraulically and still be automatic. M. Payet believes that the solution he offers can be applied not only to large installations, but to plants of average and even small size.

A FRENCH WASHER-SCRUBBER.

A PATENT has been taken out by M. Esmond Bardot for an apparatus for washing and scrubbing gas; and it is described and illustrated in the current number of "Le Gaz."

Fig. 1.

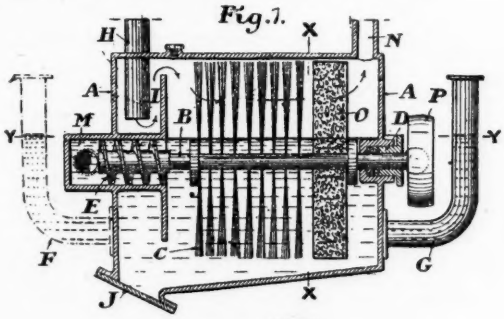


Fig. 2.

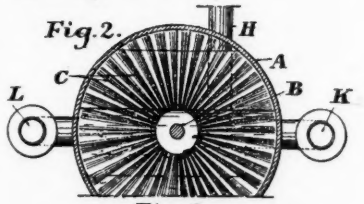
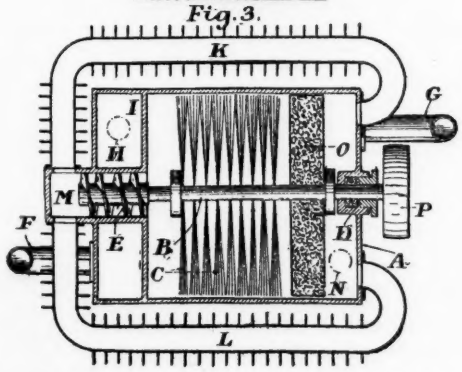


Fig. 3.



The characteristic feature of the apparatus is the cleansing of gas from its tar and other impurities by causing it to pass through a rotary brush or coke-drum. In the accompanying illustrations, fig. 1 is a vertical section of the washer, and it shows a combination of brush and drum; fig. 2 is a part transverse section on the line X of fig. 1; and fig. 3, a horizontal section on the line Y.

The appliance consists of a case A, formed with sloping bottom, as shown, and having running through it longitudinally a shaft B, carrying a brush C. One end of the shaft passes out of the case through the stuffing-box D, and has upon it a driving-pulley; while the other end carries an archimedean screw E, enclosed in a cylindrical chamber M, which communicates with the opposite side of the case by means of the flanged pipes K L. Water can be run into the washer through the pipes F G, the level being a little above the shaft. These pipes also act as hydraulic valves. The gas enters the washer through the pipe H, which dips into the trough I. After passing through the washer, the gas leaves by the pipe N. A discharge-plug J is fixed in the lower part of the inclined bottom of the washer, to facilitate cleaning. The shaft can also be fitted with a wire gauze drum O, filled with broken coke or other suitable material.

The action of the washer is as follows: The gas enters the trough I, where it is freed from the heaviest of its constituents. It then passes over the partition in the trough, as shown by the arrow, and circulates longitudinally through the upper portion of the brush, which has been previously set in motion by any suitable driving gear. The gas is thus scrubbed by the moist bristles of the brush, which form a number of baffles intercepting the particles of solid matter in the gas. These, by the rotary motion given to the brush, are deposited in the water below, and the brush is at the same time cleansed. The gas is still further purified in passing through the coke-drum O before leaving the apparatus. By the rotation of the shaft B, the archimedean screw E keeps in motion the water in the washer. It flows through the pipes K L in such a way that, when returning into the apparatus, it is cooled by the radiating action of the flanges. In the event of accidental ignition of the gas, the resulting explosion will only cause a slight back-flow of water in the pipes F G, and will not damage the washer. The water can, if desired, be kept in motion by any other device than the archimedean screw; for example, by means of a pump. Though shown in combination in the illustrations, the brush or the drum may be employed singly.

Instability of Wooden Water-Pipe.—At the annual meeting of the Central States Water-Works Association, recently held at Wheeling (W.Va.), Mr. L. W. Latta recounted an unfortunate experience he had had with 48-inch stave pipes, of which he had attempted to lay 2400 feet. The original estimate called for 48-inch cast-iron pipe; but as the cost of these was upwards of $10 per lineal foot for the pipe alone, the wooden pipe was used instead. A price was quoted of $1·20 per foot. The staves were 4 inches broad and $1\frac{3}{8}$ inches thick. The pipe was to be banded with $\frac{5}{8}$-inch round iron, 16 inches from centre to centre. After laying about 600 feet of this, Mr. Latta was standing in the ditch one day after it had been filled, when he saw the ground sinking, and found that a portion of the pipe had collapsed. It was repaired, and $\frac{5}{8}$-inch round iron rods used, measuring 8 inches centre to centre. A few weeks later this also collapsed. It was replaced, using $\frac{5}{8}$-inch round 4-inch iron rods. This also showed signs of collapsing; and a 6-inch concrete arch was laid over the pipe. Between 800 and 900 feet of the pipe were laid at a heavy expense. He is now using 48-in. by $\frac{3}{8}$-in. steel lockbar pipes, with flanged joints laid on a framework of 2-inch by 6-inch oak, and has since had no trouble whatever with it. Mr. Latta was asked if he had ever considered what the result would have been if the pipe had not been covered over until it had been filled with water. He replied that in the beginning it was a grave question whether the pipe would stand the pressure of the earth. As long as it was filled with water it held up, but collapsed as soon as the water was withdrawn.

TESTING AMERICAN GAS FOR CANDLE POWER.

As already mentioned in the "JOURNAL," one of the features of the recent annual meeting of the American Gas Institute was the presentation of a report by the Committee on "Methods of Taking Candle Power." It was a long statement, dealing with many interesting points, some of which are reproduced in the following extracts.

The Committee began by recommending that for continuous and accurate testing and for convenience in operation, the photometer-room in which the 60-inch bar photometer is installed should not be less than 14 ft. 9 in. long when gas from one supply is to be measured. Where the gas is from more than one supply, a separate meter for each supply should be provided. For each additional meter set upon the extended photometer-table, 1 ft. 6 in. should be added to the length of the room, the width of which should not be less than 8 ft. 6 in., and the height not less than 12 feet. The Committee say these dimensions are the least that will permit of convenience in movement about the photometer, the table of which should be 8 ft. 9 in. long and 2 ft. 6 in. wide, when a single meter is used. The minimum height of 12 ft. is given from considerations of ventilation.

If any wall of the photometer room is formed by a wall of the building in contact with the outside air, it should be jacketed with non-conducting material to make it readily maintain the same temperature as the sides communicating with the interior of the building. No room having walls of considerable difference of temperature can be free from draughts. The photometer-room is in best condition when built in the middle of a room that is warmed and well ventilated, and not used for any purpose tending to vitiation of its atmosphere. In this case, it may receive for its proper ventilation a supply, in cold weather, of pure, warm air from the outer room, while its sides are exposed to uniform temperature on the outside and inside. In warmer seasons, it should be protected from direct rays of the sun.

The air may be admitted through suitable openings in the outer side of the walls or partitions, thence downward with a sufficient offset to exclude light, and then into the room through registers set in the baseboard. These openings should extend right round the entire room. The total area of the register openings, for a room of the minimum size given, should not be less than 10 square feet, made up of 24 registers, 6 in. by 10 in., or their equivalent. For the purpose of light and ventilation when gas-pipes are to be disconnected, and for cleaning, two or more light-tight shutters, opening into the outside room, should be provided. Such a room will permit of the continued presence of two persons, a 5 cubic feet per hour gas-flame and the flame of the pentane lamp, and yet maintain a low degree of vitiation, without draughts.

With regard to the effects of contamination of the air, the Committee conclude, from a number of charts which they give in an appendix to the report, that it may be safely assumed that any vitiation beyond the normal will cause the candle power of the gas-flame to show higher than it would if measured under ordinary conditions. This, of course, presupposes that the several formulæ corrections for humidity and carbonic acid content as supplied to the flame standards, have not been used. The charts show that the divergencies between the gas-flame and the candles are greater than between the gas-flame and the pentane or the Elliott lamp. They say, therefore, that the room should be supplied with an abundant quantity of air, uniform in purity and in temperature, from the outside room, the temperature of which may be kept uniform either by the indirect or the hot-air system of heating. If the location is such that there is no one present at night, a gas-stove or electric heater could well be used to maintain the temperature at the desired degree during off-hours.

In climates in which the heat of the summer is accompanied by high humidity, there is introduced a problem which the Committee recognize is difficult to solve. A very disturbing factor in correct candle power determinations is the change in the quantity of water vapour present in the air. While in the winter the humidity will be below the normal at the temperature of the photometer-room, it can be brought up to normal; but in summer the problem is to reduce it. The introduction of methods of cooling the air during the summer months, by which the humidity may be controlled, appears to be essential for correct work. To compare a gas-flame with an electric lamp, normal atmospheric conditions are imperative; otherwise an error of as much as 10 per cent. may be introduced, generally against the gas-flame. The photometer-room and laboratory of the Bureau of Standards at Washington is equipped with cool brine coils, over which the air is passed; thus reducing the quantity of water vapour. The range of absolute error which is attributable to humidity alone is set forth in Mr. J. B. Klumpp's notes in the report of the Research Committee of the American Gaslight Association in 1905, in which the pentane lamp value is shown to be subject to a total variation of as much as 25 per cent. between the extreme ranges of humidity in Philadelphia in a year.

The control of the temperature of the photometer-room is a matter of prime importance. Not only must the pipes conducting the gas be protected from chilling below the minimum temperature of the gas in the mains, but fluctuations in the temperature of the room during the times when the readings are not being taken constitute a cause that leads to frequent inaccurate determinations. Gases depend for their illuminating quality more or less on the condensable vapour. When a gas passes through a pipe, the sides become coated with a condensate from the gas that will, if the temperature and the gas do not change, remain in equilibrium with the vapours in the gas. If the temperature of the condensate changes even slightly, it will no longer be in equilibrium with the vapours; and there will be an absorption of them if the pipe gets colder, or there will be a yielding up of them to the gas if the pipe gets warmer, resulting in a temporary decrease or increase in the candle power. What is true of the pipe is particularly true of the meter, the water in which is also influenced through the fact that the solubility of benzene vapours in water is affected by temperature. As with ammonia, so with benzene vapours, cold water will absorb more of them than will hot water. It is for these reasons that a sudden increase in the temperature of the photometer-room will give temporarily a higher reading of a gas-flame. An even temperature of 75° Fahr. in the photometer-room throughout the year is desirable.

The Committee recommend the use of the 60-inch bar photometer, of the improved Letheby type; and they do so without prejudice to the 80 or the 100 inch bar instrument. After diligent inquiry among the American gas companies, it is believed to be their tendency to equip themselves with 60-inch bar photometers; and they seem to have been governed by the consideration that more of these photometers of modern design are being used than any other. Of 98 sets of questions sent out to the larger companies, 73 replied. Of these, 62 have adopted bar photometers. They have in use 83, of which 37 are 60-inch, 29 are 100-inch, and 4 are 80-inch. The Committee consider the advantages of the 60-inch bar instrument are, first, that, being shorter, it requires less space; and, secondly, that the two light sources usually compared in plain gas photometry are at such relative distances from the disc as to give it the best theoretical illumination for easily comparing the star or other figure on the disc.

Assuming as normal for America a 10-candle power standard and a 20-candle power gas, the disc-box at the correct setting will, on a 60-inch bar, be about 2·07 feet from the 10-candle light, and on a 100-inch bar 3·45 feet from it. The setting being correct, the illumination on both sides of the disc will be equal. The Committee point out that the human eye has objects best illuminated to suit its vision—that is, for the sensitive discernment of differences in appearance—when that illumination is from 2 to 3 foot-candles. Computing, therefore, from the above figures, they find that for the 60-inch bar the disc has an illumination of 2·34 foot-candles, and that for the 100-inch bar the illumination is deficient, being only one-third of this, or 0·84 foot-candle. They say the 100-inch bar with a 10-candle standard is well adapted for the determination of incandescent mantle lights, where the range is from 60 to 100 candles.

The Committee recognize that the objection may be urged against any form of straight-bar photometer, such as the Letheby, that while the standard lamp used has had its value assigned when it was at one distance from the disc, yet in the operation of taking different candle powers the standard lamp is used at varying distances from the disc; and the nearer the lamp is to the disc, the greater is the light-area of its flame at the disc. In some cases, such as the Edgerton standard, this has been met by an accurate determination of the effective centre of the flame, which was then placed in the position of the standard light source. The effective centre of the circular flame of the pentane lamp is at a point forward of the geometric centre—a distance equal to one-third the radius of the flame; so that if the lamp is set up with its effective centre 30 inches distant from the centre of the bar, the effect of varying the distance of the disc from the pentane lamp will be neutralized and accuracy maintained.

Referring to the work of the Metropolitan Gas Referees, the Committee acknowledged that they and their associates made a thorough study of the advantages and peculiarities of different types of photometers prior to the adoption of the new table photometer in 1898. In this photometer, the objection just cited is met by fixing the positions of both the standard and the test light, and also of the disc, or "photoped." The 10-candle pentane lamp was placed at 1000 mm., and the "London" argand burner at 1265 mm., distance from, and on the same side as, the photoped. All the other distances of importance were similarly fixed with exactness, so that it would be possible to turn out a series of uniform instruments. The adjustment of equality of the disc's illumination was gained through varying the rate of flow of the gas; and this equality is judged from the rear of the photoped by transmitted light. The Committee think that such a method was not flexible, "as it would not easily permit the testing of gases varying widely in candle power, nor the use at the same distance of both argand and flat-flame burners." They find, however, that in their "Notification for 1907," the Referees have returned to the principle of moveable parts; but in this case it is the test flame which is made to move, and not the disc. They are not able to pursuade themselves that this is the best method of meeting all difficulties. It seems to them that, "as one requisite of accurate photometry is that both flames shall be as quiet as possible, it is a wide departure from this accepted stand to oscillate the test flame to and fro during a determination of the gas burning through it."

It was desired that actual tests should be conducted to find whether the table photometer when in operation had advantages over the type which the Committee recommend. For this purpose one was set up in a room 27 ft. 9 in. by 18 ft. 6 in. and 16 ft. high, containing a 60-inch bar photometer and a 125 cubic

feet gasholder. In this way it was possible to furnish the identical gas to each photometer, and to maintain all temperature and atmospheric conditions equal. The photometrists, after considerable practice to enable them to do consistent work on this photometer, reported that, while its design is to give greater convenience to the operator, and permit him to remain seated during a test, they were not able to make a test with as great readiness or within as narrow limits as with the other photometer. As a consequence, there is a wide disagreement in the readings by the same individual, though the average by the two methods is not far from agreement. The Committee think more practice may bring greater skill; but at present they do not see any refinement in observation by comparison of the two fields on the photoped. Apart from this criticism, they say the table photometer is "the logical development toward the elimination of several disturbing factors, such as the personal equation and the varying distance of the standard from the disc."

The Committee consider that two other points should be mentioned while speaking of the possibility of the adoption of a table photometer in American practice. First, it would not be feasible to place more meters upon the table for the purpose of testing different gases on a works photometer, because the space near the observer is already filled; and, secondly, it would be advocating the abandonment entirely of the present photometric equipment in the country, for the Committee were unable to learn of the use of table photometers anywhere. The Committee are of the opinion that, while advocating the continued use of the bar photometer, every means contributing to its greater accuracy should be encouraged. To this end, they recommend the "substitution" method in testing gas. They say on this point: "It is known that, in most cases, if two lamps, A and B, prove equal when A is at the left of the bar and B is at right, they may differ slightly when B is at the left and A is at the right. This may be due to personal equation, air draughts, unequal reflecting surfaces, or other contributory causes. If, however, A is known to have a standard value, and the desire is to test the candle power of the gas against A's units, then substitute A in the place that will be used by the gas, and evaluate B in A's terms in the position which it (B) will continue to occupy. All that is now desired of B is that it shall continue constant—yielding always the value given to it by A's units. A is then taken away, and the gas is swung into the position which A occupied. It is here subject to exactly the same environment that A had, and, through comparisons with B, obtains its candle power in terms of A. Furthermore, A, being the standard of reference, is used least and will thus be preserved longer."

The Committee emphasize the point that the installation of photometric apparatus necessary for the exact, or approximately exact, valuation of a gas-flame requires a stable equipment. Attention must therefore be given to the many details of the care of the gas in its approach to the room and in its treatment in the room. They call attention to the grave sources of error, capable of the widest ranges of injustice, that are introduced when these details are not observed. They say "the determination of the candle power of gas on portable photometers must be accepted with the greatest caution." Of this class of photometers it must be said that accuracy is often sacrificed to convenience of handling. The usual sources of error in a portable photometer are set forth as follows: (1) The photometer is closed in, and thus supplied with vitiated air; also, under this condition, such air as the flames get is supplied through small crevices and accompanied by draughts. (2) The body of the photometer is not rigid, and the movement backwards and forwards of the disc-box causes vibration of the flame. (3) The disc-box is set so near the bed of the table that the dust gathering upon the table may easily become appreciably a reflecting surface. (4) Many portable photometers are without a governor or any device for measuring pressure. (5) It is a common practice to use rubber tubing in connection with them, such tubing having the property of absorbing benzene vapours and reducing candle power. (6) A photometer equipment comprises a proper preparation of room as to ventilation and temperature, careful guarding of the gas against chilling, and other precautions against error that will not be found if the photometer is set up anywhere and everywhere.

Coming to the subject of piping, the Committee say the temperature of the gas in the pipe conveying the sample from the main to the photometer should not be allowed to fall below the minimum temperature in the main. The service-pipe should be taken from a point not above the middle of the main; and where it is carried under a water-tight pavement, it should have only a slight dip back to the main. In the cellar of the building, it should be protected carefully against chilling. The pipe should run as direct as possible to the photometer, and should be covered with non-conducting material. Several gas companies have adopted on the works photometer cooling coils through which the gas passes before entering the meter—thus ensuring at all times of the year that the candle power of the gas is at a constant temperature. The use of pure or vulcanized rubber hose for conducting gas to a photometer is condemned by the Committee as decreasing its light-giving power.

In order to secure exact measurements on the photometer meter, the gas in the drum should be under uniform pressure. For this purpose a governor should be placed on the inlet to the meter; and the Committee recommend the use of a dry one, which they say avoids the two objections to those of the wet kind—viz., the extra attention required, and the necessity for the introduction from time to time of fresh water, which must be saturated before a correct reading is to be made; and the fact that the wet governor acts as an averaging tank, and will not show changes in the candle power so rapidly as the dry one. A dry governor, smaller in size, and capable of delicate adjustment, should be placed on the outlet of the meter to still further reduce the pressure supplied to the burner, and to obviate small fluctuations caused by the dipping of the meter partitions into the water.

The Committee recommend the adoption of the wet meter passing 1·12th of a cubic foot per revolution, unencumbered by a superimposed clock; and the drum should revolve freely at a pressure of 1·10th of an inch. The rate of flow of the gas should be determined by a detached watch or clock. When gas from more than one supply is to be measured in sequence on the photometer, a separate meter should be provided for each kind of gas, in order to secure accurate determinations in the shortest interval of time. For instance, if a higher candle power water gas is passed through a meter which has previously been measuring coal gas, a considerable time must elapse before the water in the meter gets in equilibrium with the vapours in the gas of higher candle power. Until this is accomplished, the reading will be too low. In works manufacturing a mixed gas, in which the candle powers of the coal gas, the water gas, the mixed gas at the inlet, and the gas from the street governor outlet are to be measured, four separate meters are recommended. Five companies replied that they did not correct the volume of gas burned to 60° Fahr., and four did not make any correction for barometric purposes. The Committee recommend the Leeson contrast disc as being the simplest to reproduce, keep clean, and read without fatigue to the eye. They say that in gas photometry the slight irregularities of the meter, the possibility of draughts, and the dancing of the gas-flame itself, make the use of the Lummer-Brodhun disc fatiguing to the eye. But after eight hours' work, the human eye tires perceptibly with a Leeson disc, and much more quickly when reading with the telescopic disc. Twelve companies use the bunsen or grease spot, 24 employ the Leeson disc or the disappearing star, and 8 use the Lummer-Brodhun disc.

On the important subject of the test-burner to be used, which the Committee point out has been the subject of much controversy, they say that the London Gas Act of 1905 embodied the conclusion arrived at after a thorough discussion of the subject by the London County Council and the Gas Companies; and the question seems to have been settled by the adoption of the "Metropolitan" No. 2 argand burner. The Committee call special attention to the section of the Act describing the burner; and point out that it embodies a decision of the Legislature, and not merely the views of the gas companies, and that on this subject the companies and the municipal officials are in accord.

The Committee next deal with the several working standards at present used. The reports received by them show that British candles are used by 31 out of the 40 municipal and state inspectors, and by 41 gas companies; Edgerton standards by 18 companies, but by no municipal or state inspectors; Hefner lamps by 1 municipal inspector and 5 companies; electric incandescent lamps by 2 municipal inspectors but by no companies; Elliott lamps by 11 companies; pentane lamps by 31 companies and 3 municipal inspectors; and jet photometers by 28 companies, 20 of whom also use bar photometers. The Committee point out that each of these standards is the product of incandescent carbon, and that their variety occurs through the effect of the media in which incandescence is produced. The attempt to preserve their luminosity constant is made in either of two ways—(1) by a uniform consumption of fuel; (2) by the maintenance of a constant height of flame. But so long as the flame and its temperature are dependent upon a surrounding air of varying quality, the luminosity of the free carbon particles will also vary; for this luminosity varies as the fifth power of the absolute flame temperature. From this and the fact that humidity in the air exerts its greatest effect upon flame luminosity, the Committee think it is clear that the real cause of variation in the several standards is the change in flame temperature. This knowledge should assist in the selection of a standard; for we should choose the one which, while otherwise constant and reproducible, comes nearest to being affected by atmospheric changes exactly as the test flame is affected. In other words, we should expect it to be a flame of similar dimension, temperature, and air consumption to the test flame. The Committee consider that, in the list of standards given, these conditions are nearest met by the 10-candle pentane lamp.

At this point in their report the Committee define as follows what they conceive to be the ideal working standard for gas photometry: (1) The lamp should be readily portable, of simple construction, and unvarying dimensions. (2) It should have an independent fuel, reasonable in price and readily procurable, which should be of definite chemical composition, with a fixed boiling-point. (3) The flames should be of the same order of luminosity as the test flames, of similar colour, fed without a wick, at a constant pressure through a constant opening; and there should be no chimney surrounding it. (4) The lamp should be burned in a quiet room of uniform temperature, and supplied with pure air of the same temperature. After reaching thermal equilibrium, its flame height should be set, and, all the the conditions named above having been complied with, the height and value of the flame will remain unchanged for that particular atmospheric condition. (5) The flame of the standard lamp should be influenced in the percentage of its normal value

by atmospheric changes in exactly the same degree as those changes influence the value of the gas-flame to be measured.

The Committee next give a brief description of the several working standards mentioned, and point out what they consider to be their defects—following their criticisms with some observations on the subject of the unit of light. They point out that while gas photometry is about sixty years old, America has not yet adopted a scientific national unit of light. England has done so, and Germany likewise, though the units do not agree. In America the British standard candle is the unit generally employed. The Committee think the time is ripe for the photometrists, both gas and electric, of the United States, to come to some decision on this question. Already a move has been made in this direction. The Illuminating Engineering Society have appointed an International Committee on Nomenclature and Standards, of which Dr. A. C. Humphreys, the President of the American Gas Institute, is the Chairman; and he has nominated a Sub-Committee to confer with the Committees appointed by other Associations interested, for the purpose of agreeing upon a value for the national unit of light. The definition of any theoretical unit, however, avails little, if there can be no practical way of exactly reproducing it singly or in numbers. The Committee think the difficulty has been overcome in the electric glow lamp of constant low voltage, which they say may, with care, be carried to any distance without change, and be maintained for an indefinite time. Having adopted a unit, the Committee consider that the archives of the National Government would be the proper depository for it, just as it is for standard units of length and volume. The Bureau of Standards could furnish to the laboratories throughout the States electric glow lamps certified as to their value in terms of the unit; and these laboratories, or the Bureau of Standards, could give to the lamps used by gas companies in their photometrical work their proper value when burning under normal conditions, in terms of the unit.

The Committee conclude their report by recommending the Institute to take a lively interest in this subject. They point out that the English Institution of Gas Engineers have decided that the unit of light shall be one-tenth the value of the Harcourt 10-candle pentane lamp at the National Physical Laboratory; while the American Society of Electrical Engineers have adopted a resolution to the effect that the unit of candle power should be derived from the standard maintained at the National Bureau of Standards at Washington, "which equals 100/88 of the Hefner unit under the Reichsanstalt standard conditions for the Hefner." The Committee ask if such a value of the unit would be satisfactory to the American Gas Institute. The International Photometric Commission, at their meeting in July last, declared the intensity of the Harcourt pentane lamp to be equal to 10·95 Hefners; while the Institution of Gas Engineers and the Engineering Standards Committee give the English candle the value of one-tenth of the Harcourt pentane lamp, or 1·095 Hefners. The American Society of Electrical Engineers have adopted the German ratio of the Hefner unit to the candle—1 candle equals 1·14 Hefners. Their unit is consequently 4·1 per cent. greater than that adopted by the Institution of Gas Engineers.

The report is accompanied by four appendices. In the first the Committee explain how the photometer is to be arranged for the comparison of the effects of vibration upon the standards, and how the quantity of air necessary for sufficiently ventilating the photometer-room is to be computed. In the second, the absorptive action of water upon benzene vapours is dealt with. In the third, the Committee lay down the rules to be observed in testing gas for illuminating power. The final appendix is devoted to some interesting notes on English candles.

REPAIRING A DAMAGED RELIEF HOLDER.

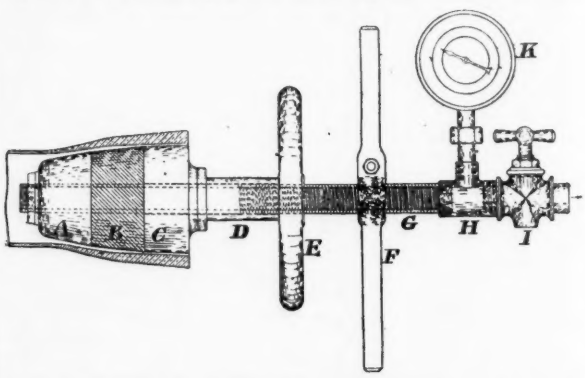
Our readers are aware, from the notice of the proceedings at the annual meeting of the American Gas Institute which appeared last week, as well as from our correspondent's communication in the present issue, that a good collection of "Wrinkles" was presented on that occasion by Mr. Milan R. Bump, who supervises this department of the Institute's work. One of them was by Mr. J. D. Shattuck, of Chester (Pa.), who told his colleagues how he repaired a damaged relief holder. The injury to the holder was caused by its being drawn down against a 4-inch U-pipe, used for tar settling in the tank, which had slipped out of its place, and come in contact with the cup of the inner lift of the holder, which was a 200,000 cubic feet one. When discovered, five of the goose-necks were broken off from the inner section, the balances were off the guides, the holder was canted about two sheets, the cup was rolled like a piece of paper where the pipe struck it, and the holder badly buckled on the side. The damage occurred during a storm; and the water-gas maker relied on the tell-tale, which showed no sign of the trouble. Gasholder makers said the only way to repair the damage was to land the section, clean the tank, which contained 100,000 gallons of tar, raise the outer section by jack-screws, and cut out and replace the damaged portions.

Instead of doing this, the following plan was employed: They first landed the section, thoroughly ventilated it by air-blast, and syphoned 2 inches of light oil from the surface of the tanks by means of inverted syphons working near the surface. They then blew the inner section up with air, cut holes through the grip of the outer section at each column, and inserted through these holes heavy hooks that had been made. These were attached by means of a two-inch hemp cable to the horizontal girder. The gauge on the holder showed a pressure of 3 inches. The air was permitted to escape until there was 7-10ths of pressure on the gauge, and the crown was just waving. This stretched the cables nearly a foot. The goose-necks were tied to the column as securely as possible, and the balance of the air was let out of the section, so that the goose-necks took some of the weight. Mr. Shattuck found that he had succeeded in hanging the section level; and it stayed so throughout the three weeks it hung on the cables, which stretched during that time nearly another foot. He then drew the water down in the tank below the cup, proceeded to cut out the damaged section of the holder, took out the bent cup, sent the piece to a ship-building place in the neighbourhood, and had the channel-iron rolled again. He put this section of the cup together on the ground, and was able to re-insert it in position with very little difficulty, contrary to the advice given him by the gasholder people, who said that the holder would spring together at this point when the section was cut out, and that it would be practically impossible to force it apart and put the piece in again. As a matter of fact, this was easily wedged into its place.

Mr. Shattuck says the most difficult job of the entire work was to bend about 2 feet of channel-iron of the next section. He did not wish to cut any more than the one section. In order to turn the bent piece back by hand, he made a number of tools for this and for driving up the rivets in the cramped corners; and he succeeded in driving up every rivet but three on the work. The end which was bent badly and was reshaped in place by means of the tools, is not perfectly true; but it is joined up with the section that was cut out, and has made a tight job. The load was 8200 lbs. on each cable and column. The air was kept pure in the holder by means of a canvas air-blast. The entire work was completed in about three weeks, at a cost about one-third of any estimate given by the gasholder builders for doing these repairs, and also without accident of any kind.

TESTING THE SOUNDNESS OF GAS-MAINS.

A recent issue of "De Ingenieur" contains a description of a simple and portable apparatus for testing the soundness of gas-mains, which can easily be carried about and used without loss of time. As shown in the accompanying illustration, the device consists of an expanding stopper composed of two blocks of wood A and C and a rubber washer B. A and B are rigidly connected with the screwed tube G. E is a hand wheel, the rotation of which presses the sleeve D and the block C against B until the rubber expands. F is a hand-grip to hold the apparatus steady before B



begins to bite the pipe. The outlet from the valve I leads to the pump, whereby the necessary testing pressure is set up. The device is specially suitable for the examination of Mannesmann pipes intended for the high-pressure distribution of gas, provided they are not too large in diameter—the testing pressure being one effective atmosphere. It has recently been employed with much success at 'sGravenhage, and is said to save from two to two-and-a-half hours of work on each occasion when the length of main laid every day has to be tested before the men cease work.

With the aid of some new apparatus of their own, Dr. C. V. Drysdale and Mr. A. C. Jolley have determined the luminous efficiencies and total power consumption of some of the recent highly incandescent electric lamps, and have also conducted bolometer tests with these sources of light, so as to determine the calories per second and the watts per candle power, and thus the mechanical equivalent of white light and of monochromatic light from several sources. Dr. Drysdale has recently communicated his researches to the Royal Society; and they are dealt with in an article in a recent number of "Engineering." Pending more exact determinations, the investigators named conclude that an ideal source of white light should give 10 candles per watt, and a monochromatic yellow-green source nearly 17 candles per watt.

THE MANCHESTER GAS EXHIBITION.

INFORMAL CLOSING.

THE Manchester Gas Exhibition closed at ten o'clock on Saturday evening without any formal ceremony. Up to and during the last hour, people were as eagerly passing into the St. James's Hall as they had been every day since the formal opening of the Exhibition by the Lord Mayor more than a fortnight previously. Never has display of the kind been more successful. It was held under the very best of auspices, and managed throughout in a capable manner. Compared with the similar show at Earl's Court, the general opinion of the exhibitors is that the Manchester Exhibition exceeded it in general interest and resultant profit. The multifarious exhibits were set forth in their most attractive garb; and many of the stalls were examples of art as well as utility. If the whole show had not been pre-eminent of its class, its attractiveness must have waned long before the closing day. Novelty and variety arrested one's attention at every step. Day by day the visitors were counted by thousands. Apart from mere sightseers, gas engineers were attracted to it from all parts of the three kingdoms—one enthusiast having journeyed over from Gibraltar. One of the exhibiting firms kept a diary of visitors who might be classed as "technical;" and this recorded 450 of such visitors. Not only did gas engineers of various orders themselves attend, but they were so impressed by what they saw that mechanics were afterwards sent at their employers' expense to take more than passing glances at the latest inventions and improvements in the gas industry. Nottingham seems to have been the town most noted for this class of self-sacrificing enterprise. The exhibitors all over the building were remarkably unanimous on Saturday night in testifying their gratification at the results attained. Not a discordant note was sounded anywhere. Another satisfactory part of the Exhibition was the daily cooking demonstrations and lectures by acknowledged masters on subjects connected with gas lighting and heating. In almost every instance these lessons and lectures were well attended, and excited a degree of public interest of the most pleasing kind. Perhaps the best commentary on the Exhibition is to be found in the general desire by the exhibitors that no long period may elapse before another is held in some other great trade centre.

COOKERY LECTURES AND COMPETITIONS.

Among those who will look back on the Manchester Gas Exhibition with pleasure and gratification will be Mrs. E. Middleton, who justified fully the selection made for the important part that cookery lectures, demonstrations, and competitions must always supply in the educational work and attractions at such gas displays. Skilful, courteous, endowed with initiative, and clear speech, her lectures acted as a magnet; and during their course the lecture hall has been continually thronged. Last week, at the evening lectures, it was no unusual thing to hear the commissionaire at the door announce to those who sought entrance that there was not even standing room; and it was also not an uncommon thing to find ladies taking possession of seats long before the demonstrations commenced, in order not to be disappointed. On Saturday evening, at the concluding lecture, the applause and personal congratulations that Mrs. Middleton received pronounced better than we can do in mere words how great was her success. But there has to be an end to all such good things; and at the last meeting with her appreciative audience on Saturday, Mrs. Middleton addressed to them a few remarks. She commenced by wishing His Majesty the King "Many Happy Returns of the Day"—a sentiment that was heartily endorsed. Continuing, there was an expression of gratitude to the audiences for their attendances. Another point was that, during the exhibition, the demonstrations had been conducted on no less than fourteen different makers' cooking-stoves—in every case with perfect success. At the close, on all sides, one heard that this had been the best and most successful course of lectures held in Manchester.

A small appreciation of Mrs. Middleton's efforts on their behalf was shown by the exhibiting makers of gas-stoves. It consisted of a gift of money with which to purchase a memento of the Exhibition. There was no doubt as to the value Mrs. Middleton placed upon this kindly recognition.

Regarding the cookery competitions for school girls, the "final" took place on Monday last week; and the occasion brought together a large attendance. As the smart work of the little maids was proceeding, a glance round at the faces of the spectators found them in all parts of the hall marked with the deepest interest. The results of the competitions were posted up in the hall on Thursday; when it was found that the proud possessor of the gold medal was Elsie Durden, of Victoria Park School, and that the silver one had been awarded to Gladys Jones, of the Leicester Road Centre. The gold medallist, it is interesting to note, is under twelve years of age.

Last Tuesday, Mr. S. MEUNIER, of Stockport, gave a lecture, illustrated by lantern slides, entitled

THE POOR MAN'S LIGHT.

The lecturer began by reminding his audience that from time immemorial there must have been some system of illumination; but that for several centuries prior to the discovery of coal gas oil-lamps of various types were practically the sole means in use. In the Thirteenth Century, the first tallow candle was made; but it was doubtful whether at that time it could be called the "poor man's light," as the cost was 36s. a dozen, and to steal one meant certain death to the thief. Candles were now cheap enough; but they had been superseded, in the ordinary working man's home, by the modern type of improved oil-lamp. Before proceeding to describe these lamps, gas-burners, &c., Mr. Meunier gave a short *résumé* of the discovery and manufacture of coal gas, which he characterized as the "premier lighting medium of the million." He said three names had been put forward for the honour of discovering that the distillation of coal would yield gas that could be used for lighting—viz., Minckelers, a Dutchman, Lebon, a Frenchman, and Murdoch, a Scotsman; but Murdoch's work was the most meritorious, as he was the first to put the discovery to practical use. The comments on Lebon's work which appeared in the Press attracted the attention of Winsor, a German, living in Frankfort, who turned his attention to the manufacture of gas, and eventually succeeded in lighting the Lyceum Theatre in London, in 1803. In spite of much chaff and opposition, he and his friends approached Parliament in 1812, with the result that the first statutory gas company—the "Chartered Gaslight and Coke Company," now the largest gas company in the world—came into existence. Passing on to deal with the manufacture of gas, Mr. Meunier, showed upon the screen views of various portions of the plant employed, and explained their working. Specially interesting was the illustration of a retort-house equipped with mechanical stokers and conveyors.

Having shown how coal gas was discovered and the appliances used in its manufacture, the lecturer proceeded to deal with it as a commercial article. He pointed out that in the early days consumers were charged a certain price per hour or per burner for the gas they used; and he remarked that the Stockport Gas Act of 1837 expressly gave power to the Commissioners to contract for lighting in this way. These methods of charging proving unsatisfactory—tricks being played with the burners to get more gas out of them, and the number of hours bargained for being exceeded—Samuel Clegg invented the wet gas-meter, which was subsequently improved by John Malam. The meter then came into general use; and Mr. Meunier showed his audience how to read it.

From the meter, the lecturer passed to the burner. He said the idea for the first gas-burner belonged to Murdoch, who accidentally found that by placing his wife's thimble, which had several small holes in it, over the gas-pipe, his light was greatly improved. From this small beginning vast strides had been made—thus from ¾ of a candle illumination per cubic foot of gas consumed with the old iron burner, we had improved to 20 candles per cubic foot with low-pressure incandescent burners. The researches of Messrs. Sugg and Bray increased the power of the ordinary flat-flame domestic burner to 2½ to 3 candles per cubic foot. After this came Frederich Siemens with his regenerative burner (which was only suitable for large spaces and heavy consumptions), whereby from 10 to 15 candles per cubic foot were obtained. The discovery of Baron Auer von Welsbach, however, entirely altered the field of action. By showing how to utilize the heating value of gas by creating a non-luminous but intensely hot flame in a way discovered fifty years ago by Roscoe and Bunsen, he opened out a vista of boundless possibilities.

Although gas might be considered the most suitable illuminant for both rich and poor alike, Mr. Meunier went on to point out that for many years the artisan had to be content with the ordinary oil-lamp. In the first instance, this was no doubt due to the high charges made for gas, which were not reduced at a very rapid rate until the electric light scare of about 25 years ago roused gas departments and gas engineers alike. As the effect of this was felt, the price was rapidly brought within more reasonable limits; but it was not until the advent of the penny-in-the-slot meter, which enabled the working classes to pay for gas as required and in small amounts, that they were put in a position to take full advantage of its greater economy and safety. This was shown by the fact that in the industrial towns in the neighbourhood of Manchester many of the small ordinary meters had been taken out, and replaced by those of the prepayment type. In Stockport alone, 10,223 of these meters had been fixed since 1896 without an advertisement of any kind. In connection with this type of meter, their friendly enemies the electricians cast longing eyes upon this large field of supply, evolved electric meters to sell current in a similar way, and tried to persuade the working man that the additional handiness and greater safety and cleanliness of the electric light, and its (supposed) better value in duty against the common, ordinary flat-flame gas-burner in use, would more than compensate for the higher price they would have to charge to cover the heavy cost of installation, &c. That the artisan could put two and two together very well, and believed in obtaining the best value for his money, was shown by the fact that very little was now heard of the prepayment electric meter, or of any business being done in pennyworths of electric current. What was the cheapest form of lighting, and therefore the most suitable for use in working

men's dwellings, was shown by the following table, compiled by Mr. J. G. Newbigging, the figures in which he (Mr. Meunier) fully endorsed:—

Incandescent gas		740	candles for 1d.
Flat-flame gas-burner		111	,, ,,
Electric lamp		133	,, ,,
Single-wick oil-lamp	(21·10 candles)	241	,, ,,
Double-wick ,,	(23·73 ,,)	166	,, ,,
Round-wick ,,	(45·00 ,,)	167	,, ,,
Altman incandescent lamp	(90 candles)	538	,, ,,
Welsbach ,,	,, (60 ,,)	549	,, ,,

From these figures they would see that the incandescent mantle carried the palm in every way; for even when used in conjunction with an oil-lamp it doubled the effect, and so reduced the cost. Mr. Meunier showed a number of burners of various classes and prices, together with two incandescent oil-lamps. He said the cheapest forms were bought off a stall in Stockport Market; but while they undoubtedly gave a better light than the flat-flame burner, as the gas and air passages were absolutely fixed, there was not the same opportunity for economy as in the higher-priced articles, the light yielded was less, and there was the possibility of an offensive smell being given off, due to imperfect combustion. He therefore strongly advised his hearers to use the higher grade of burner, in which adjustment could be made in the supply of either gas or air, or preferably of both, thereby ensuring that, in whatever town it was used, and whatever might be the quality of the gas supplied, the burner itself could be made to meet the conditions, and give the best and most economical results. He further suggested to the worker that, instead of using the upright incandescent burner, he should pay the slightly higher cost for an inverted one, which could easily be put on either the shoe pendant in general use or the bracket fixed in a bedroom. He would gain an advantage from the fact that burners of smaller consumption could be used to give the same light; and the mantles, though perhaps costing slightly more, were stronger, and resisted vibration better. They knew how some houses were built, and how the floors of bedrooms shook; and there was less likelihood of the consumer having foisted upon him or her the waster of the German incandescent mantle maker, which his home consumer would not have at any price. Looking at the question all round, he would be well advised to carefully consider the future economy in working, rather than the present apparent saving in original cost—thus ensuring for himself and his family not only better value for his money, but also a brighter and more cheerful-looking home.

In bringing his lecture to a close, Mr. Meunier said there was one matter to which he should like to draw attention, and which, though not coming within the purview of lighting, was of great importance to workers—viz., the question of the type of griller usually let out with the slot meter. He recently had some tests made, in consequence of repeated complaints as to excessive expenditure; the tests being carried out on three different makes of griller—two with round burners, fixed deflector, and double ring of holes, and one with the general type of long burner, with movable deflectors, to be used when required for grilling purposes. The results, at 2 inches pressure, were as follows:

No. 1 Round Burner.—Top ring, 11 cubic feet per hour; bottom ring, 12 cubic feet per hour; both rings on, 23 cubic feet per hour.
No. 2 Round Burner.—Top ring, 13 cubic feet per hour; bottom ring, 19 cubic feet per hour; both rings on, 32 cubic feet per hour.
No. 3 Long Burner, 23 cubic feet per hour.

These figures, said the lecturer, spoke for themselves, and showed the type of griller makers should lay themselves out to supply, and gas departments, in their own interests, should recommend to their working-class consumers. One did not want the entire use of a burner consuming 23 cubic feet per hour to boil an egg; and it was very certain that as the artisan declined to entertain the sweet blandishments of their electrical friends and their penny-in-the-slot supply of light, so would he decline to use the griller, although supplied free, if he found that his pennyworth of gas was being wasted at both ends of the burner in order to obtain what heat he required in the middle. In conclusion, if the various points he had mentioned were duly and carefully considered by gas departments, and if they would lay themselves out to foster, encourage, and advise the preponderating number of workers in every town in the Manchester district—showing them the very latest and most economical appliances for lighting and heating—he ventured to say they would find that one of the steadiest, most reliable, and expanding sources of revenue would be "The Poor Man's Light."

Deputation from Belfast.

A deputation from the Gas Committee of the Belfast Corporation visited the Exhibition last week, and made a thorough inspection of all the exhibits with a view to introducing into Belfast the most modern systems of gas lighting and heating. The visitors were on Wednesday the guests at luncheon in the Town Hall of Mr. Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, who had invited the members of his Committee and the chief officials of the Gas Department to meet them. In proposing "The Belfast Gas Committee," he welcomed the deputation, and referred in complimentary terms to the way in which representatives of the Manchester Corporation had before now been received in Belfast, and to the existence of the best feeling between the great Municipalities and their officials. He dealt at length with the debatable question of grants in aid of rates being given from gas profits—a practice he strongly deprecated.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Mr. Henry Austin on Co-Partnership.

At their Meeting last Friday (which was held at the Cripplegate Institute, Golden Lane, E.C., under the chairmanship of the President, Mr. W. Upton), the members of the London and Southern District Junior Gas Association had before them the subject of "Co-Partnership," which was dealt with in a paper by one who is from experience well able to speak of the many advantages the principle possesses—Mr. Henry Austin, a Workman Director of the South Metropolitan Gas Company. Mr. Austin is an enthusiast on the subject—as he remarked before reading his paper, he is a "thorough co-partner," having enjoyed its privileges for eighteen years.

Before calling upon Mr. Austin, the President referred to the recent visit to Manchester, for the benefit of those who did not go down with the party. He said they had a remarkably good time. The party was 37 strong; and there was not a single hitch. It would interest them to know that that which they had so long been trying to bring about—a united meeting of the Councils of the different Associations, or their representatives—was being arranged. Before long they hoped to obtain some sort of federation among the Junior Associations, though exactly the lines it would take, they could not yet say. The only point that had been decided was that they should work together. They would have many meetings in the future on the lines of the Manchester gathering. The matter was not yet fully in trim; but in February there would be a meeting of the Councils to deal with it. Turning to the subject of the paper, he remarked that businesses were growing larger and larger, and the relations of Capital and Labour were in a state of transition. When there are thousands of men employed in a concern, it was impossible to exercise the personal superintendence which obtained in a smaller business; therefore there was the loss of the personal equation. This was a distinct loss; and they had to find something to take its place.

Mr. Austin then proceeded to read his paper. In the course of it, he explained that co-partnership in an industry was the sharing of profit between the capitalist, the worker, and the customer; and it must be worked on business lines, and be free from philanthropy. The scheme, as far as it had gone, afforded the most hopeful outlook as the best solution for labour troubles, because if the worker was a shareholder he would be involved in a loss if he struck; and he would not strike against himself. Where co-partnership had been tried, strikes and lock-outs were unknown; the experiences of many businesses where the principle had been adopted proved this. He quoted from the Board of Trade report on labour disputes during last year [which was noticed in our issue for the 8th ult., p. 87] to show the disastrous effects of strikes; and then he drew attention to a letter written by Sir George Livesey to the "JOURNAL" in 1903, in which were set forth the benefits that had accrued from co-partnership in the cases of the South Metropolitan, South Suburban, Commercial, Chester, and Newport Gas Companies. In the course of this letter, Sir George remarked, "I can say that during the fourteen years the system has been in operation with the South Metropolitan Company, and the nine years with the South Suburban Company, there has never been any difficulty or the slightest anxiety in connection with the workmen. This alone is a strong argument in favour of, and a sufficient reason for the adoption of, the system." The principle was described, and its success was explained, by Mr. J. G. Frost, who, when addressing the profit-sharing employees of the Chester Gas Company a few weeks ago, said "the ideal of the scheme was to enable every employee to become one of the proprietors of the undertaking, and consequently feel the interest of a partner in the prosperity of the concern."

The qualities necessary to prosperity, Mr. Austin pointed out, were labour, thrift, self-denial, and spending less than one earned, and he asked whether co-partnership evolved these qualities. The answer, he thought, was easily found in the history of the South Metropolitan Company's scheme, which was started in 1889, and had since made great strides. Most of them knew the history of its beginning, many had watched its progress, and a large number had shared in its prosperity. In eighteen years, the Company had paid to their employees no less than £390,844, by way of bonus upon salaries and wages calculated on the selling price of gas. To add to the value of the scheme, it had taught thrift to the employees, who had saved, by weekly instalments or otherwise, £132,000, the interest upon which amounted to £23,544. The dividend upon their stock in twelve years, including the last half year, came to £55,000. In the early part of the scheme, there was an inclination on the part of a number of the employees to draw all the money they could; but last year all the bonus was invested in stock, and he believed this year would prove as favourable. At the end of 1906, there were 4993 co-partners holding stock of a market value of £250,559, on deposit at interest £59,650, and invested in the purchase of houses £24,300—or a total of £334,707. A building society was carried on by the employees, who had purchased, or were purchasing, 230 houses. By the enumeration of these large amounts, remarked the author, one might be led to think that the workman had become a selfish being; but this was not so. There was a benevolent fund, for which a penny a week was collected from wages by the pay clerk. The fund was managed by a committee of workmen elected at a general meeting. This fund was used to help to send the sick to

hospitals, to secure letters to convalescent homes, and to assist wives and children when the bread-winners were away. This was true co-partnership—the strong helping the weak. As to the South Suburban Company, they had now 530 co-partners holding £21,000 in stock; while there was a sum of £3500 on deposit at 3 per cent. interest.

When the amounts he had referred to were coupled with the superannuation scheme, said Mr. Austin, they enabled the aged worker to live in peace and security, as many belonging to the South Metropolitan Company were now doing. Several had retired earlier than they had hoped to do—thus helping to solve the problem of the unemployed. It made all the difference to those who were left whether a man ceased work at fifty-five, sixty, or sixty-five. The earlier one could retire, the better it must be for those who remained. The figures he had given clearly proved how effectually the co-partnership scheme was "levelling up," and bringing home to the toilers some rays of sunshine. If they could only read the minds of those who had a good nest-egg, who felt secure from the relieving officer's snub, what pleasant literature it would make. How different would the history of the labour movement have been written had this scheme been in existence a century ago! It must have been better. He hoped that the figures he had given bore testimony to the efficiency of the co-partnership scheme in accomplishing all that the founder claimed for it—the uniting of capital and labour in a harmonious whole. He might be allowed as a participator in the scheme, to express his feelings as a worker from childhood to old age. He had never come across any scheme that was so capable of helping the toiler to help himself to rise to that condition which would enable him to have a few years of rest between the cessation of toil and the grave. The toiler in his every day struggle (which might become monotonous) required an inspiration; and he was sure this inspiration was supplied by the possibilities and the certainties of the co-partnership scheme. Figures were just to hand which gave the amount of stock taken up this year by the South Metropolitan employees as £35,500 (nominal value).

The discussion which followed the reading of the paper was mainly taken part in by those who, like Mr. Austin, were able to set forth the benefits of co-partnership from experience. The first speaker was Mr. C. T. Drumgold, another Workman Director of the South Metropolitan Company. He remarked that the unsatisfactory position of Capital and Labour, which had been referred to by Mr. Austin, was one of those self-evident facts which unfortunately had to be recognized; but the matter was receiving earnest attention, and co-partnership was their particular way of solving the problem. Co-partnership had been described by a manufacturer in the North of England as "business up to date;" and as those engaged in the gas industry liked to be up to date, it was not unnatural that the system should be adopted, and they would also not be surprised to find the South Metropolitan Company leading the way. As generally happened, in the struggle between Capital and Labour neither side could entirely get its own way; and so the only thing was to compromise. Co-partnership was a very good example of compromise—of an endeavour to bridge over the difficulties between Capital and Labour, and bring them together as friends. There was a point at which both worked at their best for their mutual advantage; and co-partnership found this point—where it paid the capitalist and it paid also the employee to work for and not against each other. An important thing was that their scheme was based on business. There was no charity about it; and if there had been, it would have failed. It simply appealed to a man from a business point of view. Their contention was that Trades Unionism was old-fashioned—that, however useful it might have been in the past, for the improvement of the condition of the working classes something better was now needed. When a man had been with their Company a few weeks, the system was explained to him, and he was given an opportunity of signing the agreement, which not only carried with it the bonus, but also ensured to the man regular work for a certain number of months—varying between three and twelve. The bonus was declared at the end of each June; and last year it amounted to 9¾ per cent. on wages and salaries. The agreement was offered to all regular employees, and even to those who were engaged only throughout the winter months; so that practically everyone who worked for the Company had the chance of earning more than his wages. Of course, the bonus varied with the price of gas. A few years ago, for instance, it dropped from 9 per cent. to 3¾ per cent.; but the men knew that when they had less bonus the shareholders had a smaller dividend, and no one objected to the falling off as the arrangement seemed so just. Another point was that the bonus was not paid in cash. A cash bonus was a failure from beginning to end. At the present moment, the average amount that their men were worth—and when he said "men" he meant those on the weekly pay-sheet, leaving out the officers—was about £50 in the Company's stock and savings; but, of course, some of those who had been at the works from the time of the trouble in 1889, and had received their bonus every year, were far above this. They thought nothing of speaking to a man who had even £130 of stock. The starting of co-partnership required a great deal of courage on the part of Sir George Livesey; but this he did not lack. It was owing to his care and watchfulness that the system had grown as it had done.

The two Workmen-Directors of the South Suburban Gas Company (Mr. W. G. Waller and R. Wyllie) also testified to the great benefit the men had derived from the scheme. Mr. Waller said he had watched the men from a boy; and since co-partnership had come into operation, there had been a great change. The men were more energetic; and they naturally took much greater interest in their work. It had also improved their wives, and children, and homes. He was only surprised that such schemes had not been more generally adopted throughout the country. Mr. W. A. Barnett (of the South Metropolitan Company) remarked that he had worked out a few figures relating to the seventeen years that the bonus had been distributed. He found that a labouring man paid at their lowest rate of 6d. an hour, or 27s. a week, if he had been with the Company the whole of that time, would have received a total bonus (the average was between 6 and 7 per cent. per annum on the wages) of about £80, without reckoning any interest. The interest on this, at 5 per cent., would be some £36. The two would thus come to £116. This was worth considering. Then take a man employed at the standard rate for engineers of 8½d. per hour, or £1 18s. 3d. a week. The bonus over the period mentioned in his case would have been £114; and 5 per cent. interest (about what it amounted to) would have added £51, making a total of £165.

In proposing a hearty vote of thanks to Mr. Austin, the President remarked that the whole scheme they had had explained to them was a business one. It was a fair deal—good service and good pay. He had often wondered, with other people, why the principle had not been more extensively adopted. Mr. W. J. Liberty, in seconding, said if any of them had any regret it must be that they were not employees of the South Metropolitan Company. Whenever he had visited the works, he had been struck by the happy, contented appearance of the men. Mr. F. Ainsworth supported the motion, and remarked that while listening to the paper they must all have thought what a pleasure it would be to have Sir George Livesey with them at one of their meetings. He remembered how they enjoyed Mr. Newbigging's company at Manchester.

The vote of thanks was carried by acclamation; and Mr. Austin acknowledged it. In the course of his answers to various questions, he explained that, instead of getting 9¾ per cent. bonus, they would have 7½ per cent. next time. For every penny the price of gas was raised above or reduced below 3s. 1d. per 1000 cubic feet, the bonus went down or up ¾ per cent.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held on Saturday, at the City of Birmingham Technical School—under the chairmanship of the PRESIDENT (Mr. W. E. Caton, of Derby), when the following paper was read by Mr. A. W. TWINE, of the Nechells Chemical Works, Birmingham.

SULPHURIC ACID AND ALKALI.—ITS HISTORY, MANUFACTURE, AND PRODUCTS.

Without doubt, sulphuric acid is the most important and useful acid known, as by its means nearly all other acids are prepared, while its manufacture constitutes one of the most important branches of modern history, owing to the great variety of purposes for which it is needed, as there is scarcely an art or a trade in which, in some form or another, it is not employed. Roughly speaking, about nine-tenths is used for making sodium sulphate, and ultimately sodium carbonate, bleaching powder, soap, and glass.

Probably sulphuric acid was known to the ancients; but possibly Geber, the Arab, gives us first mention of it. He spoke of it as the "Spirit" expelled from alum. An Alchemist named Abu Bekr Alrhases, who died in A.D. 940, also mentions it. In 1740, a quack doctor named Ward first made sulphuric acid on a large scale at Richmond, Surrey. He employed glass vessels holding between 65 and 70 gallons, which stood in two rows in a sand bath, and were provided with horizontal projecting necks. At the bottom was placed a little water. In each neck there was an earthenware pot; and on this there was a small red-hot dish, into which a mixture of 1 part of saltpetre and 8 parts brimstone were put. Then the neck of the bottle was closed with a wooden plug. The combustion being finished, fresh air was allowed to enter the vessels of the apparatus, and the operation continued till the acid in the bottom of the vessels was strong enough to pay for concentration. This method, called Ward's "Bell" method, was a great improvement on any way then known of making acid. It reduced the price from £2 to 2s. per pound.

An extremely important improvement in vitriol manufacture was the introduction of the lead chambers. The first one was erected by Dr. Roebuck, of Birmingham, in 1746. The chamber was 6 feet square. A mixture of saltpetre and brimstone was put into a small iron waggon, and was run into the chamber on rails. The chamber was closed, and the process carried on intermittently in this way.

To-day, sulphuric acid is manufactured in two ways: The first is by burning brimstone or sulphides into sulphur dioxide, and further oxidizing the latter, either by oxides of nitrogen or by air, in what is known as the new contact process. The second method is by decomposing natural or artificially-prepared sulphates for making fuming oil of vitriol. Brimstone is undoubtedly the most convenient raw material from which to manufacture sulphuric acid; but, generally speaking, the sulphur is obtained from iron

pyrites containing a little copper. Another method, and perhaps to us the most interesting, is obtaining the sulphur from the spent oxide of gas-works. The sulphur originally comes from the iron pyrites in the coal; and this sulphur appears in the gas chiefly as sulphuretted hydrogen.

In 1857, Mr. F. C. Hills took out a patent for removing sulphuretted hydrogen from gas by means of a mixture of hydrated ferric oxide and sawdust. In this case, sulphide of iron and sulphur are formed, in accordance with the equation $Fe_2(OH)_6 + 3H_2S = 2FeS + S + 6H_2O$. This reaction goes on in the mixture until about 12 per cent. is taken up. It then becomes inactive, but by exposing it to the air, it again passes over into ferric hydroxide, and more sulphur is precipitated; $2FeS + 3O + 3H_2O = Fe_2(OH)_6 + S_2$. This revivification can take place until about 50 to 60 per cent. is obtained. The oxide is then sold to the vitriol manufacturer on the percentage of sulphur it contains. Sulphuretted hydrogen given off in the manufacture of sulphate of ammonia furnishes another source of sulphur, especially where the works go in for making acid. Although these gases evolved from the sulphate plant are very dilute, yet so long as they are kept free from ammonia, they prove very profitable to the manufacturer.

As most of us are connected in some way or another with gas-works, it will be better for me to describe the manufacture of sulphuric acid from spent oxide. The gases leaving the furnaces pass into a main flue, in which is built a nitre-pot, which is a cast-iron vessel. From here the gases pass into a brickwork stack, where a very great portion of the dust is deposited before entering the bottom of the Glover tower, which is filled with brickwork or other material of a suitable character. The gases leave the tower almost at the top, and enter the first of a series of chambers. The residual gases leaving the chambers pass into the Gay Lussac tower at the bottom. After all the nitre gases (that are possible) are absorbed, they enter the works chimney.

The sulphuric acid chamber consists of a very large rectangular leaden vessel built on a wooden framework, and supported on brick and iron columns. The size varies considerably. The usual width is rarely below 20 feet or above 30 feet; the height varies from 16 to 25 feet; the length is rarely below 90 feet, and goes up to 300 feet. The bottom of the chamber, consists of a huge dish, from 2 to 3 feet deep; while the sides do not come right on to the bottom, but a space of about 3 inches is left. At various distances, sight-glasses are fixed, as also are drip and bottom acid test places. There are also thermometers fitted in, and a necessary steam or water spray supply. The object of a good chamber process is to make the greatest amount of acid with the smallest possible consumption of nitre.

We must burn off all the sulphur possible from our oxide or pyrites; and our burner gases should be of the right composition, which composition can be regulated by means of the draught. In a set of four chambers, the first and second should show a slight pressure in a water U-tube. The third should be almost at equilibrium, while the last should show a slight vacuum. The best way of estimating the draught is to find the percentage of oxygen in gases leaving the Gay Lussac tower. Generally speaking, a well-balanced plant shows about 6 per cent. of it.

Too much draught upsets the working by cooling the furnace gases, also by defective utilization of chamber space, and by aspiration of air through any holes in the chambers and carrying sulphur dioxide and oxides of nitrogen away. On the other hand, insufficient draught causes the burners to get too hot; and in the case of pyrites, it scars the lumps so that sulphur is not properly burnt off. It also allows the gases to blow out of the burners, connecting-pipes, &c. It further causes insufficient oxidation of sulphur dioxide within the chamber, and escape of nitre gas, because the oxygen, forming absorbable N_2O_4, is not present. Either cause gives a bad yield of vitriol, large consumption of nitre, and escape of sulphur dioxide into the air. Generally speaking, the draught takes place by various contrivances, at the exit end of the plant; the best form being a mechanically driven fan.

The regulation of steam or water is one of the most important parts of chamber arrangement, and needs close attention. The Glover tower supplies the first chamber with a good deal of the steam required. Hence steam or water spray is seldom required here. The proper indicator for the admission of steam or water is the strength of the acid made in the chamber, both as observed in the drip and bottom acid. These strengths are never identical; the drip being a little the stronger. There is some difference of opinion as to the strength of acid most conducive to good working. Generally speaking, we in England work our chambers at a higher strength than people on the Continent. Ours vary from 120° to 130° Twaddel in the first chamber; while they work at from 106° to 112° Twaddel. The last chamber strength should be about 90° Twaddel, or even a few degrees above this.

Again, may I mention the evil consequences of wrong water supply? The first and most obvious consequence of too much steam is that the acid gets too weak. But this is a minor affair compared to what immediately follows. If the lower oxides of nitrogen meet with an excess of oxygen (which is always present in the chamber), and at the same time with an excess of water, these reactions take place:

$$2NO + 3O + H_2O = 2HNO_3$$
$$N_2O_3 + 2O + H_2O = 2HNO_3$$

That is to say, they are converted into nitric acid, which, in the first instance, is a much less efficient carrier of oxygen than nitrous acid, and, secondly, is to a great extent dissolved in the bottom acid. Here it assists but very little in the acid-forming process; and, moreover, it acts upon the lead. So long as the bottom acid is pretty strong (say, 90° Twaddel), it would not keep the nitric acid, but give it off as lower oxides of nitrogen by the action of sulphur dioxide. But if the excessive supply of steam continues, it will soon keep the nitric acid back, and as the process is thereby disturbed, even the steam which should have been used up in the formation of sulphuric acid is condensed to water, and the dilution of the bottom acid is again increased. The chambers show that they have too much steam by going pale. A pale chamber often goes red again in an hour after the supply of steam is partially cut off.

Though the risks run by a deficiency of steam are nothing like so serious as those arising from an excess, yet, unless care is exercised, much inconvenience is caused in this direction. Too little steam deteriorates the conditions for formation of sulphuric acid, since the substance formed in an intermediate state—viz., nitroso sulphuric acid—cannot then be entirely decomposed into sulphuric acid and nitrous acid. It will, in this case, either be separated in the solid state as chamber crystals, or else it will dissolve in the bottom acid. The acid then is said to contain nitre. A certain quantity of nitre must be present in properly working chambers; but if there is too little steam, then this quantity is increased both by a deficiency of water in the acid mist floating about, which leaves a large quantity of nitroso sulphuric acid undecomposed, and by the excessive concentration of the bottom acids, which enables it to hold more nitre in solution. Thus the nitre is removed from its proper sphere of action (the atmosphere of the chamber), and sulphur dioxide will escape oxidation.

Temperature is an important factor in chamber management. Though different works show great discrepances in various parts of the apparatus, the temperature is pretty constant in the same works as long as the plant is working properly. It may be taken there is some irregularity in the working, if a rise or fall of 9° Fahr. is noticed in any part of the process.

After the gases leave the chambers, they pass into the bottom of the Gay Lussac tower, where the nitrous gases are absorbed. This tower consists of a leaden column, filled with a material presenting a large surface, such as coke or special stoneware. I may mention, in passing, that in our own works (those of Messrs. Brotherton and Co., Limited), we have lately built a new tower packed with glass. It is so splendidly arranged that practically all nitre gases are absorbed. The tower has given every satisfaction; and at some later date, I hope to be able to give full particulars of it. The large surface presented by the packing of a Gay Lussac tower divides the supply of sulphuric acid, which is allowed to run over the surface into very fine jets, and thus the contact between the acid and the gases is multiplied. The principle here applied is exactly the same as that of gas-works scrubbers, for washing gas free from ammonia. The strength of the acid run down the tower should be at least 144° Twaddel; but acid of 148° to 152° Twaddel is better, and it should be run down as cool as possible. The acid, on reaching the bottom of the tower, is charged with nitrous compounds. This nitrous vitriol has to be so treated as to liberate all these nitrous compounds, and leave the acid as pure as we started.

The Glover tower, invented by Mr. Glover in 1859, accomplishes this. It fulfils the function of denitrating the Gay Lussac acid, and also concentrates at the same time a quantity of chamber acid which is run down the tower with the Gay Lussac acid. The acid running down over the chequered brickwork, &c., meets the very hot gases from the burners, so that the sulphur dioxide acts denitratingly upon the nitroso sulphuric acid—

$$2SO_2(OH)(ONO) + SO_2 + 2H_2O = 3H_2SO_4 + 2NO.$$

There is another very fine tower on the market, invented, by a Mr. Gaillard. This tower consists practically of a stone tower with no packing whatever. The acid is sprayed in at the top, and denitration takes place perfectly, because of the heat and sulphur dioxide.

Before leaving the subject of sulphuric acid, I should like just briefly to mention the new method of manufacturing sulphuric acid by what is known as the contact process.

In the year 1831 a British patent was taken out by Mr. Philips to convert SO_2 into SO_3 by means of the catalytic power of platinum. Probably Philips was not able to go on very far with his work, but like very many other English patents the keen foreigner was ready to benefit from it, with the result that, after studying the problem, a practical means of producing sulphuric acid was arrived at, though in the earlier days these men had to content themselves with making Nordhausen fuming acid.

At last the "Badische Analin und Soda Fabrik" perfected and cheapened the process to such an extent that they pulled down their acid chambers and built plants for the new process. In 1899 they applied for patents in all countries for their process. The process consists of obtaining SO_2 in the ordinary way, but combining this SO_2 with oxygen from the air.

The reaction takes place at a temperature of 380° to 400° C. The SO_2 and air are passed over platinized asbestos, but care must be taken that no dust or arsenic compounds be present in the gases. The absence of dust is indicated by an optical test—*i.e.*, the mixed gas is run through a tube with glass ends, and is viewed from the one end. Arsenic is removed by blowing in steam under pressure (this is a secret process, and details are

not known). Dust and arsenic compounds soon spoil the platinum, so that it loses its power as a catalyst.

The platinum asbestos is contained in a sort of regenerator—*i.e.*, the furnace gases and air pass round the reaction tubes; thus they get heated up to the required temperature. This reaction is exothermic, so that the apparatus needs heating theoretically only once at starting.

It is absolutely necessary to keep the temperature constant—inlet at about 380° C., and gases leaving about 234° C. This temperature is maintained by increasing or diminishing the supply of gases through the tubes of the apparatus. The tubes containing the contact-substance are about 9 feet long and 5 inches in diameter; and the asbestos is supported in the tubes on special sieves.

In some processes two catalysts are used. The gases are first passed at about 530° C. over oxides or sulphates of Fe.Cu.Ni. or Co. The SO_3 formed is removed, and the remaining gases are passed over heated platinized asbestos in the usual way at 400° to complete the reaction.

There is a process where pyrites cinders are used as a catalyst. If SO_2 and O are passed over these cinders at a temperature of 300° to 400° C., a quantity of SO_3 is absorbed, and no SO_3 is produced at first. On continuing the process, however, and increasing the heat of the cinders, SO_3 is formed. The catalyst is Fe_2O_3 of the cinders. In using this principle the gases travel in one direction and the cinders in another by mechanical means. At first the SO_2 is absorbed to form $Fe_2(SO_4)_3$; afterwards with increased temperature it is again decomposed. In the Mannheimer-Verein process there are two contact spaces and also two catalysts—first, Fe_2O_3; second, platinized asbestos. The advantage here is that the arsenic, &c., in the gases are absorbed by Fe_2O_3, and do not affect the platinum.

It would be impossible to simply allow the SO_3 formed in the contact process to mix with water, as the reaction would prove too vigorous, and much SO_3 would be lost. So in practice the SO_3 is absorbed by 97 to 98 per cent. sulphuric acid. This is then fed with H_2O and SO_3 in such proportions that the strength is maintained at 97 to 98 per cent. Even up to this time there is great difficulty in keeping the exit gases down to below 4 grains of SO_3 per cubic foot. In the manufacture of sulphuric acid up to 80 per cent., the chamber process can still compete with the contact process in the question of price. At the same time it is doubtful if in the near future the old chamber process will be able to make acid either as good or as cheap as this new method. At the present time in Britain there are only two works using it.

Alkali Manufacture.

As the method of manufacturing alkali by the Leblanc and ammonia-soda process is known to you all, I will not trouble you with those details; but I should like to say a little about the electrolytic methods. The principle of electrolysis takes place as follows—

$$NaCl \text{ gives } Na + Cl, \text{ and further } 2Na + 2H_2O = 2NaOH + H_2.$$

In the year 1800, Cruikshank noticed that, on electrolyzing a solution of NaCl, NaOH was formed at the negative pole. In 1803, Berzelius confirmed this; and about the same time Davy recognized that during the electrolysis of K_2SO_4 he obtained KOH at the negative pole and H_2SO_4 at the positive pole. Very little notice, however, was taken of this; and when Lunge's work was written in 1880, only fifteen lines were devoted to an electrolytic process. In 1888, Dr. Hurter could merely say that such a process could only become useful if the electricity required for decomposing a molecule of NaCl could be generated with the expenditure of less coal than we require in the ordinary process; and, he said, "this is not the case." In these days, however, it is very different; and we are bound now to recognize the great advance of electrolysis in alkali manufacture. In the majority of other cases, alkali occupies the most prominent place. The ammonia-soda process is practically a process for manufacturing soda only. The Leblanc process in its early stages was a process only to produce sodium carbonate and not hydrochloric acid. Competition has, of course, altered these conditions; and now hydrochloric acid, or bleaching powder, manufactured from it, sometimes plays a more important part than the soda itself.

In many cases of electrolysis, however, the aim is to produce bleach or chlorates, &c., and not alkali. The great difficulty of electrolytic plants for alkali was in finding a material capable of withstanding the action of nascent chlorine, and of constructing a diaphragm efficient to prevent the mixture of the liquids on each side of the diaphragm, and yet for this diaphragm to be of low electrical resistance. In the Greenwood process, they use an anode of plates of gas carbon coppered on the one side and cast to a core of type metal, in order that a large plate of this refractory form of carbon may be made. The diaphragm consists in a series of wedged-shaped slats, packed with asbestos. An iron plate can be used as cathode, where there is no corrosive action. The process is continuous; separate supplies of brine being circulated through the cathode departments. Chlorine is given off in the former; while the liquor in the latter becomes enriched with NaOH, until a concentation is attained at which the liquor can be evaporated; the salt being fished out, and the sodium hydrate being finished in the usual way.

The chlorine, which is full strength, can be used for bleach-making. No attempt at present is made to utilize the hydrogen. Direct production of chlorates by electrolysis becomes possible, if the electrolyte be hot, and both chlorine and alkali allowed to mingle. The method of suppressing hydrogen with caustic lime is here convenient, as the use of a diaphragm may then be dispensed with, and intermixture facilitated. The following reaction takes place—

$$6KCl + 3H_2O = KClO_3 + 5KCl + 6H_2$$

The advantage of this method is that cheap KCl can be directly converted into chlorate.

In the Castner-Kellner plant, the chambers containing the carbon anodes are divided by partitions dipping into mercury from the central chambers containing the iron cathodes and caustic soda. In the outer chambers, the mercury takes up the sodium, forming an amalgam. The cell is given a slight rocking motion, which carries the sodium amalgam into the central chamber, where it is decomposed, forming caustic soda and hydrogen.

[The paper was extensively illustrated by lantern slides, models, specimens, and practical demonstrations (valuable assistance being rendered by Mr. Stone), which were exceedingly useful in emphasizing the various points dealt with by the author.]

Discussion.

The President having announced that the paper was open for discussion,

Mr. J. H. Willoughby (Leamington) said he could not claim any knowledge of the manufacture of sulphuric acid; but he did know something about its use on the gas-works. They were all aware that some years ago the rough-and-ready method of the Twaddel hydrometer was employed as the means for selling their ammonia; but now they distilled it, and with the aid of sulphuric acid sold it at its own strength. Of course, they were all more or less familiar with oxide. In fact, he could not call to mind anything that had been brought more to their notice than this. In gas-works the oxide was used, and revivified, until it became charged with such an amount of sulphur that it was no longer of any value to them; and then they disposed of it. Mr. Twine had explained to them the means by which this waste product of the gas-works was turned to account in a profitable commercial venture. He had shown them what the chemical manufacturers did with the spent oxide after the gas undertakings had disposed of it; and certainly this was very instructive to them. He (the speaker) followed the paper right through with pleasure. It was gratifying to know that, after the spent oxide had been sold, there could return to the gas-works from it an acid, which was of use to them again. There was only one question that occurred to him, and this was the amount of sulphur it was necessary that spent oxide should contain to render it of marketable value. It was usual for a gas-works to dispense with it when the sulphur got to between 50 and 60 per cent. Still they sometimes got rid of it before this figure was reached; and it struck him that it would be an advantage to know what was the lowest percentage at which treatment would be profitable. Would it pay if the oxide contained 30 or 40 per cent. of sulphur?

The Hon. Secretary (Mr. James Hewett) said he had received a letter from Mr. A. O. Jones, of West Bromwich, who regretted he was unable to be present, as there was one point upon which he wished to make some inquiries—namely, the capital cost of plant, and the cost of manufacture, which were not mentioned at all. He thought it would add to the value of the paper if Mr. Twine could give some information in this respect. Spent oxide, as they knew, did not realize the price that it fetched some ten years ago; and nowadays it became a question whether it would not pay the larger gas-works (especially if they made sulphate) to manufacture their own sulphuric acid. Consequently, if Mr. Twine could give the members some particulars as to what was the smallest sized plant which could be worked economically, and the capital and manufacturing costs, they would be much obliged to him.

Mr. Twine said that, as a matter of fact, they would not buy spent oxide at the works with which he was connected if it contained less than 50 per cent. of sulphur—unless at a very low price indeed. The expense attached to burning off for anything below that was really more in proportion than it was worth. The expenses were exactly the same for an oxide of 40 per cent. as for one containing 60 per cent.; and it did not pay the average chemical manufacturer to deal with an oxide containing under 50 per cent. of sulphur. He was not in a position to give any particulars in regard to costs; but Dr. Lunge, in his work on "Sulphuric Acid" (which was the best book written on the subject), published some details in connection with this matter. They would see from these the enormous cost that was involved. He questioned whether, by fitting up a sulphuric acid works themselves, corporations would find themselves anything in pocket. Seeing the very heavy outlay that was involved to start with, he thought it was one of those things better left outside. To his mind, the existing conditions were preferable. Of course, with such a large undertaking as Beckton, the erection of a plant was an advantage, because there they had the whole concern combined; and in some other cases the complete cycle was carried out with profit.

The Hon. Secretary asked whether the author would tell them the quantity of sulphuric acid produced (say) per ton of

oxide with 50 per cent. free sulphur in it. Also would he explain the reasons for the shape of the chambers being rectangular in plan. Would it not be better if they were circular?

Mr. G. C. PEARSON (Birmingham) remarked that it was gratifying to think their spent oxide was dealt with in such a careful manner. He inquired whether anything was being done with the oxide after burning off in the furnaces, so that it could be used in the gas-works again.

Mr. WILLOUGHBY said that, with regard to Mr. Jones's query, he thought the members would find details of cost and a description of the construction of plant for manufacturing acid by burning oxide, in a paper read by Mr. Fletcher W. Stevenson, when he was with the Sheffield United Gas Company.

The PRESIDENT remarked that they were very much indebted to Mr. Twine for his instructive paper. It certainly did not fall to the lot of most gas engineers to have the control of a sulphuric acid plant; but from the point of view that they were large users of the acid, the paper was most interesting to them. The excellent description furnished by Mr. Twine of the plant and the various operations, both in the paper and by the slides and experiments, gave them a good idea of what really took place; and he had great pleasure in proposing a very hearty vote of thanks to him.

Mr. R. J. MEIKLEJOHN (Rugby) seconded the proposition; and it was carried by acclamation.

Mr. TWINE, after acknowledging the compliment, said that without the help of Mr. Stone he could not have shown them what he had. With reference to the quantity of sulphuric acid made from a ton of spent oxide containing 50 per cent. of free sulphur, it might be taken that 98 cwt. of sulphuric acid contained 32 cwt. of sulphur. If therefore 32 cwt. of sulphur made 98 cwt. of sulphuric acid, 10 cwt. of sulphur would give 30·6 cwt. of sulphuric acid. Then they must allow something for loss on working, which varied from (say) 3 to 7 per cent. Circular chambers were used in Germany, and he believed by the United Alkali Company; but he did not think there was any great advantage in them (though he could not speak definitely on the point), and the construction was more difficult than in the case of the ordinary rectangular form. With regard to Mr. Pearson's query, they were working very hard in the direction he had indicated, and he had no doubt there was a very great future before the manipulation of the oxide so that, after burning off in the furnaces, it could be used in gas-works again. There were about twenty works employing such oxide at the present time, and there had been very good reports received as to its working. The day would undoubtedly come when it would be the usual thing for gas undertakings to send to the chemical manufacturers their oxide containing 50 per cent. of free sulphur, and get it back again containing nothing.

Uxbridge Gas Arbitration; A Correction.—In the report of the proceedings in this arbitration which appeared last week (p. 433), the price paid by Messrs. Darby and Co. for the Colnebrook Gas-Works was given as £500. We learn from Messrs. Corbould, Elliss, and Mitchell, the Solicitors for the Uxbridge Gas Company, that the figure should have been £900. A similar correction will be necessary in the article dealing with the matter in our editorial columns.

Manchester District Institution of Gas Engineers.—We learn that arrangements have been made for a meeting of the Institution to be held at Liverpool, on the 30th inst. The members will be the guests of the Liverpool United Gas Company, and are invited to inspect the Eccles Street and Linacre works. Among the special plant to be seen will be the Fiddes-Aldridge stoking machinery, the Woodall-Duckham vertical retorts, Tully's methane-hydrogen water-gas plant, and plant for the recovery of cyanogen.

Scottish Junior Gas Association (Eastern District).—The next quarterly meeting of the Eastern District Section of this Association will be held in the Heriot-Watt College, Edinburgh, on Saturday next, when Mr. J. T. Wright will read a paper on "Hydraulics," and the following questions will be submitted for discussion: (1) "The relative advantages or disadvantages of a general high-pressure system as compared with individual installations." (2) "How best could the attendance at quarterly meetings be increased, and is the present hour the most suitable?"

Gas as a Fog Disperser.—The use of gas as a fog preventer has often been urged in the columns of the "JOURNAL" and elsewhere; but now the fog fiend can, it is claimed, be conquered by gas explosions purposely caused. At to-day's meeting of the London County Council, the Public Control Committee will report as follows: "Our attention has been directed to an apparatus invented by M. Demetrius Maggiora, having for one of its objects the application of atmospheric vibrations to prevent the formation of fog or to disperse it in case it is already formed. The inventor claims that this can be effected by means of explosions of acetylene or other gas in a strong steel cannon about 60 feet high and 6 feet in diameter. We have been furnished with an estimate of the cost of a trial installation of this invention; but before coming to any decision on the subject, the Director of the Meteorological Office has very kindly consented to examine and report upon the proposal and its suitability to the atmospheric conditions of London, and we hope to be in a position to report further on the subject at an early date."

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Meeting of this Association was held in the Technical College, Montrose Street, Glasgow, last Saturday evening. There was a very good attendance, presided over by Mr. W. WILSON, of Falkirk, the President.

The PRESIDENT intimated a notice of motion, for next meeting, by Mr. A. H. Whitelaw, of Glasgow, that the rules of the Association be altered so as to provide: (1) That the membership of the Council be increased from six to ten; (2) that only half of the Council retire annually; and (3) that the annual meeting be held at the end of the session, instead of the beginning.

MODERN STOKING.

Mr. H. RULE (Falkirk) read a paper on this subject, in the course of which he said that when their President asked him some time ago to read a paper on "Modern Stoking," with a description of the installation at Falkirk, he readily consented, although he pointed out that most of them would already have read his previous contribution on the subject to the Eastern District. His remarks must naturally intrude somewhat on the former paper; but as he was now in a position to give further details as to working costs, &c., he trusted that they might be none the less interesting to them, and that the paper might be productive of a healthy discussion, which, after all, was the real aim and object of their meetings.

To give, first of all, some slight idea of the retort-house and the working conditions therein, he might say the house was on the stage-floor principle. The bench consisted of twelve through beds of eight retorts, with two ascension pipes to each retort. The ovens were heated by a producer situated on one side of the bench—*i.e.*, on the side opposite to that of the stoking machines. This arrangement enabled the charging and discharging to be done from one side, by the projector type of charging and the pusher type of discharging machine; the hot coke conveyor being on the opposite side of the bench. Thus the whole work of carbonizing was carried on with the minimum amount of labour—ensuring the work being equally distributed on both sides of the retort-house. The gritty coke dust was also kept away from the machines and motors; all the coke being handled on one side of the house. The motive power was electricity, and was supplied to the machines by overhead trolley wires supported on brackets fixed on the side walls of the retort-house.

Having described the stoking machinery, which is that of Messrs. Robert Dempster and Sons, Limited, of Elland, the author went on to say that at any moment during the operation of charging, there were about 17 lbs. of coal in the charger, and each blade projected 2¾ lbs. at each revolution. The machine had already dealt with some 38,000 tons of coal, or about 13,500 charges; and the wear and tear had been quite negligible on the original parts, which were good for a considerable amount of work yet. Since the machine was installed, it had been the endeavour of the management to give every assistance to the attendants in securing level and well regulated charges; and towards this end, one or two ideas had been put into practice, a description of which might be interesting. (1) It was found, though the handle of the controller was set to a certain point at the beginning of each charge, that, either through fluctuation in voltage or other causes in the motor itself, the speed of the charger, or the revolutions per minute, were not always the same; the result being that the coal was not projected to the far end of the retort, and too much was left for the end of the retort next to the charging machine. A speed indicator was therefore fixed. Now, practically no notice was taken of the position of the handle of the controller, because when the attendant got a speed of 80 revolutions per minute on the indicator, he knew that the coal would be put through all right. (2) It had also been found that something was needed to show how the charge was proceeding into the retort. The coal was fed at a fixed rate of flow by a band conveyor. To this band conveyor was attached a small wheel and, by means of a chain, drove another wheel. The latter was geared to a pointer, which moved through a certain space on a dial. The spaces on the dial represented hundredweights. The pointer was held at zero until the attendant drew the lever to admit the coal to the machine, when it commenced to indicate the quantity of coal delivered into the machine by the band conveyor, and so projected. The attendant, by merely glancing at this at any time during the charge, could now tell if he was proportioning out the coal rightly or not, and alter the speed of the charger accordingly. This they found was very useful in training new stokers, or where a sudden change in weight of charge was necessary—in fact, any unskilled labourer could manipulate the machine after a short trial. The machine had now dealt successfully with all grades of coal—cannel, splint, and coking coal—and with all these the resulting charges had been of the same uniform perfection. The positive action of the machine caused the coal to lie very compact—*i.e.*, the charge was homogeneous from end to end, a point which, no doubt, would appeal to most of them.

Three of the ropes attached to the discharging machine wore for a considerable period; and as these ropes cost 13s., 7s. 6d., and 10s. 6d. respectively, the upkeep was trivial. The fourth rope, however, wore out after dealing with the coke from about 1600 tons of coal. This rope was easily replaced; but its cost

was 17s. As this rope had to take the entire strain of the push, it was obvious that its life must be shorter than the others. With a view of increasing its life, it was proposed to alter the arrangement by substituting two ropes. The time occupied in the actual discharging of the coke from 6 cwt. of coal was 31 seconds; while the time actually taken from the moment of leaving one retort till the next was discharged was 40 seconds. It must not be supposed that as soon as the machines were installed everything was plain sailing. Far from it. Practically untried, there were many weaknesses, small in themselves, but which, nevertheless, had their effect on the working of the machine. These had to be overcome as time went on and experience found necessary; but the general principle of working had remained the same. The machines had now come up to the high expectations formed of them, and, in his opinion, had entirely justified their perseverance with them. The success with this first installation has led to the introduction of others throughout the country—the most recent being a combined machine at Stirling.

Undoubtedly, electricity for working stoking machines had proved itself a very convenient form of power indeed; and, when the current could be procured cheaply, it would compare very favourably with other forms of power, both as regards cost and convenience in application. The first cost of installing would also be found on a level with that of other power; and its chief merit was that power was only used when work required to be done. The upkeep, however, was rather costly; but they were insured against breakdowns. The insurance premium was £4 per £100. He had prepared a statement showing the current required for power purposes at Falkirk; and from this it would be seen that the cost was high. The current was supplied by the Corporation electricity supply station at 1½d. per unit. The cost of a small generating plant had been gone into; and from the following figures it would be seen that there should be no difficulty in producing current at about half the present cost.

Cost of Generating Plant with Gas-Engine.

Gas-engine, 76 B.H.P.	£410
Switch board and connections	20
Foundations, &c.	20
Dynamo	140
Sundries	10
Total cost	£600

Cost of Working Same.

Interest and sinking fund at 6 per cent.	£36
Gas at 1s. 3d. per 1000 cubic feet	66
Wages	25
Repairs	15
Waste, oil, water, &c.	4
Total annual charge	£146
Total units of electricity required	56,800
Cost per unit	·61d.

These figures would, it was to be hoped, prove sufficient to induce the Gas Committee to put in their own plant. No mention had been made of the cost of the building for the plant, as it was proposed to put it in the exhauster house, where there was plenty of room. The wages might seem low; but the running of the plant would be looked after by the exhauster and boiler attendants on the various shifts.

The following figures represented the expenditure on renewals during the past twelve months. As they would notice, the ropes on the discharger formed the largest item; but, as already pointed out, it was hoped to considerably reduce it in the future.

Charging Machine.

Blades	£3 10	
Trunnions	7 0	
Tips and sundries	1 0	
Labour	6 0	
		£17 10

Discharging Machine.

Ropes	£16 18	
Pusher head and repairs on same	1 5	
Sole plates for do. and sundries	1 10	
Skates	2 10	
Labour	7 10	
		29 13
		£47 3

It would be observed that the combined cost of upkeep was £47 3s.; but these figures did not, of course, include the repairs to motors or electrical work of any kind, and worked out at 0·45d. per ton of coal carbonized. They found continual employment for an electrician attending the various motors and machines.

He had prepared a statement of carbonizing wages, both of the old and new works. At present, when manufacturing 830,000 cubic feet of gas per day, the following men were employed in the retort-house per shift: Machine side: One man on the charging machine; one man on the discharging machine; and one man for opening and closing doors, and dodging pipes, &c. Coke conveyor side: Three stokers, who open and close doors, dodge pipes, and clean producers; one coke conveyor attendant on the day shift only. At the old works, with hand stoking, there were twelve stokers on each shift, making only 725,000 cubic feet per day; and as these men had to wheel and break their own coal, wheel away and quench their own coke, in addition to charging and drawing the retorts, it would be seen that the conditions of working were now infinitely better. The cost of wages per ton of coal carbonized from coal-waggon to coke heap were: Old works, 2s. 4·59d.; new works, 1s. 5·83d.—saving in new works, 10·76d.

There were many considerations to be taken into account before deciding upon what kind of stoking machines were to be installed in a gas-works; and these were: (1) The size of works; (2) first cost of machinery; (3) suitability for existing retort-house; (4) cost of upkeep; (5) cost of power for driving; (6) simplicity in working. With regard to the first, he did not think it would pay any works manufacturing less than 100 million cubic feet per annum to go in for power-driven stoking machinery, as it was only when the machinery was utilized to anything like its full extent that any real economy resulted. Other considerations would no doubt appeal to them, and did not call for any remarks from him.

Discussion.

The PRESIDENT asked the members to pass a very hearty vote of thanks to Mr. Rule for giving them, he trusted, much food for reflection.

Mr. J. NAPIER MYERS (Saltcoats) said he was surcharged with questions and queries regarding the machines referred to; but he would second the President's proposition. He had been able to follow pretty clearly the whole movements and operation of the machines, and could see that the projector was designed very largely on similar lines to the ordinary rotary exhauster, but that instead of projecting gas it projected coal. If sufficient care were taken with the coal, he had no doubt that the machine would do its work as well as Mr. Rule had stated. This brought home to him the necessity for the due preparation of coal for use with all charging-machines; and it reminded him of what he had expressed before, that there was need for the preparation at the collieries of the various grades of coal required by gas managers for the different modes of charging. It would certainly be better that this work should be done at the collieries than at the gas-works, especially when these were small. It would be the best place also for making use of the small stuff which was apt to be caused in the preparation of the coal, by making it into briquettes. This would be better than the converting it into breeze at the gas-works. His impression was that for a small gas-works the machines shown were too elaborate. Old-fashioned men were apt to be a little shy of these things. For himself, none of them had ever impressed him so much as hand-charging had done, when he was very much younger, performed at Plymouth by squads of five well-drilled men (doubtless obtained from the British Navy) using the scoop. The coal was all small North of England coal; but he never saw charging which appeared to him to be cleaner, or more easy for the men. He would thoroughly endorse what Mr. Rule had said about the extreme suitability of electricity for doing work of this kind. He thought it was the very best use electricity could be put to—to use it for power. There was one point, about generating their own electricity, which might be cleared up. Mr. Rule placed to the sinking fund only 6 per cent. He (Mr. Myers) thought that, according to the precedent set in parliamentary schemes, such a small percentage would hardly be allowed; because it would give such a long life to electrical machinery. The figure named might, he thought, safely be doubled. This was the only point of perhaps adverse criticism he had to offer upon the paper.

Mr. A. H. WHITELAW (Glasgow) said that, like Mr. Myers, he could not speak from experience of the type of charging-machine alluded to; but he thought that by listening to so able a paper they could learn a great deal. To really understand the working of such a machine, however, they ought to see it in operation, or have some experience with it. At the same time, he saw a point illustrated which was worth looking at. This was that in the machine they were making use of one of the great forces in Nature—viz., centrifugal force. It was a great illustration that centrifugal force acted tangentially to the line of motion. He was greatly struck with the comparison as to the cost of electricity taken from the local authority and that generated by themselves; and, in his opinion, gas managers who were erecting new works were certainly not keeping abreast of the times if they neglected to use electricity for power. He did not know, however, that if he were putting in coal-elevators and stoking machinery, he would use motors for driving them, because, owing to the great friction, they would require a large amount of power. To his mind they might look forward to a time, not far distant, when stoking would be done by gravitation. Then horizontal retorts would be a thing of the past, and vertical ones would have taken their place.

Mr. P. M'DOUGALL (Helensburgh) said he thought that it was generally admitted that horizontal retorts worked by machinery gave the best results, besides being rather more economical, when the producer was of the built-in type. With the different kinds of discharging machinery now on the market, much less time was required for filling the furnaces than was the case with the rake machines formerly used. The coke dropped into the furnace without any difficulty, and required very little attention. However, he did not think the machines were affected so much by the type of producer adopted as by the amount of work they were sometimes called upon to do. It was certainly a good thing to have stoking machinery in a gas-works, as it would reduce to a minimum the arduous labour of the men. But it had to be borne in mind that there was a limit to its employment. Works pro-

ducing much below 100 million cubic feet per annum could not profitably instal it because th e production was too small to keep the machinery fully employed; and, in his opinion, where it could not be kept going the whole year round, instead of being a profit, it would prove a loss. Mr. Rule had shown them the advantage to be gained by the introduction of machinery; and he (Mr. M'Dougall) had often thought that if retorts could be made to work off heavier charges in a given time, a great saving would be effected in the retort-house. In Scotland there was much difference between the maximum and the minimum output of gas; and he considered that in gas-works with makes varying from 1 million down to 300,000 or 350,000 cubic feet, manual machines were well suited. The cost of coal carbonized would vary according to circumstances, and wages would be anything from 1s. 6d. to 2s. per ton. The average for manual machines would be about 1s. 8d. per ton. Referring to power machinery, he believed, from what he had seen of the De Brouwer projector and discharger, it was the best machine for medium-sized works, besides being the cheapest, and, to his mind, the most humane in its action. For working through retorts, one set was all that was required.

Mr. J. Fraser (Provan) remarked that one thing which pleased him better than anything else in the paper was the statement that the people of Falkirk contemplated generating their own electricity. It occurred to him that if they did not do so, and anything went wrong with the Corporation generating station, Falkirk would be very much in the dark.

Mr. J. A. Robertson (Alloa) asked if, when coking coal was being used, any difficulty was found in the charges being too stiff and not properly burnt off, because with coking coal this difficulty would sometimes be found with the De Brouwer machine.

Mr. W. Blair (Helensburgh) said he had seen the machine described at work, and, so far as he had been able to judge, it appeared to be one of the simplest, and he should imagine that the wear and tear would be no greater with it than with the De Brouwer machine. Of course, if they changed from one class of coal to another, they might have difficulty. But with a coking coal, when once they got the proper regulation of the charge, he thought they would have little or no difficulty. In fact, he considered that the more it coked the easier it would discharge, because in coking it had a tendency to leave a free space at the sides, and the coke would slide off much more easily.

Mr. J. F. Harrison (Glasgow) said that he had seen a similar machine in operation, and it certainly did its work very well. Regarding the cost of generating electricity, Mr. Rule's figures came to practically the same as an electrical engineer of one of the Railway Companies told him it cost to supply a railway station with light; so that the estimate was correct in practice.

Mr. J. MacLeod (Kirkintilloch) said he had two comparatively simple questions to ask. The first was this: When coal was very fine and dry, and the day was stormy, was there any danger of the coal being blown aside from the mouth of the retort, or was the speed of transit between the shoot and the retort so great that it passed over the space without being blown aside? The other question was as to how and where the waste water for cooling the ram was discharged.

Mr. T. H. Whitehead (Provan) asked whether, after the discharger had been working for a time, it was found that it had caused more injury to the retorts than was the case with the Arrol-Foulis machine, which drew out only a small portion at a time. He said he apprehended that, in pushing out all the coke at once, there must be a certain amount of friction; and any retorts which were cracked or damaged would be likely to receive more damage from the pushing. He considered it would have been more interesting to the members if Mr. Rule had brought before them the machinery for elevating the coal.

Mr. J. Bell (Airdrie) asked if there was ever any trouble from the stuffing or caking of the material. Suppose they were putting in a very gummy charge, the small stuff might choke up the retort, and prevent the coke getting out at the other end. He knew there had been difficulty in this respect with pushers; and he should like to know whether Mr. Rule had any trouble.

Mr. Rule, in reply to the various remarks upon his paper, said with regard to the cost of generating electricity, the 6 per cent. was the amount they set aside for their own plant. The motor they had was of 35 H.P., which gave them a good margin. In order to fill the producer, they had to discharge the retort at two operations. The machine pushed the coke out too fast to enable the men to get it through the shoot into the producer. They had no trouble at all with coking coal. The greatest difficulty they had was with cannel. Being of a very hard nature, it was rather sore on the tips of the blades; but beyond this they had had no trouble at all. They broke the coal to rather a fine size, and very little of it was dropped at the mouthpieces. If any fell, it was at the end of the charge, when the motion was slow. He had not had any experience with Arrol-Foulis machines; but he could say that there had been very little wear and tear on their retorts. This was the third year of working, and they had had no repairs on account of machines. He would have been very pleased to give some figures as to the elevating of the coal; but he had had little time in which to prepare his paper. Occasionally, when they had a green charge not properly worked off, there would be some buckling; but he was thankful to say that these occasions had been few and far between. He thanked the members very much for the way in which they had received his paper.

The President, supplementing Mr. Rule's remarks, said there were only two retorts at Falkirk which they could not push, and neither of them was in that condition owing to the use of the discharging machine. His belief was that the life of a retort was very much longer with a discharger than without one. It was only when they had a green charge of coal, in a semi-plastic condition, that jamming took place. If the charge were well burnt off and the heat good, there was no difficulty whatever.

QUESTIONS DISCUSSED.

The meeting then took up the discussion of several questions which were submitted by the Council. The first two were taken together. These were—

How should an incandescent burner be adjusted to give the best results?

What is the most suitable pressure to give on district mains?

Mr. J. Fraser remarked that they would require to select a given area, as the question depended entirely on the district.

The President said during the week he happened to be in a gas engineer's office in Glasgow, and he saw no fewer than three King's gauges before him. They were each connected with a Corporation gas station, and the peculiar point about them was that they were all at exactly the same pressure. There was not the hundredth part of an inch of difference between them.

Mr. A. H. Whitelaw was afraid they would find variations of pressure throughout Glasgow, in spite of this fact; for in his own house he had scarcely enough pressure to light his sitting-room. Though he had three inverted burners in the room, he was sometimes quite ashamed of the light. There might be a fault in the supply-pipes, and he was quite willing to attribute the defective light to this. In his opinion, if they had a workman who knew the best way to fit up an incandescent burner under all conditions, they would have a miraculous man.

Mr. W. M. Mason (Glasgow) pointed out that Mr. Newbigging said that no pressure should be over 20-10ths. It so happened that the pressure in Glasgow was above this—at least in the central district. Both Mr. Newbigging and Mr. O'Connor said that the greater the pressure the greater the leakage. He found that this was not correct according to practice. In 1870, the leakage of gas in Glasgow was 21 per cent.; ten years later it was 18 per cent.; ten years after that it was down to 11 per cent.; in another period it was 10 per cent.; and for the last three years it had been 9 per cent. The pressure had gone up considerably. He asked a superintendent of street-mains what would be the right pressure; but he would not tell him. He said that five or six years ago the pressure was considered to be very good at 17-10ths; but that now, on a foggy day, he would not like to see it below 20-10ths. Mr. Newbigging laid down as a safe rule that the lower the pressure could be brought, consistent with efficient supply, the lower would be the unaccounted-for gas; and in regard to lighting, he said it was clearly established that the lower the pressure, provided it was just sufficient, at which gas could be burnt, the better would be the light.

Mr. W. Blair expressed the opinion that before a burner could be regulated or adjusted they must know the pressure of the gas supplied. The latest incandescent burners had regulators for both air and gas. A good deal depended, too, upon the quality of the gas. The poorer the gas, the less air it required. Suitable pressure depended upon the district, the distance, and the size of mains. The rules laid down by Mr. Newbigging and by Mr. O'Connor did not hold good to-day in the same sense that they did when they were formulated. They were right enough then, because it was flat-flame burners that were used. Nowadays a higher pressure was needed for incandescent burners. He knew he had a higher pressure, and the unaccounted-for gas was less.

Mr. J. F. Harrison was sorry to find the first question was being entirely shelved. In the case of four Bray burners, with which he made an experiment, at 13-10ths pressure, he found, on removing the mantles, after he had regulated them, that in one case the flame was soft, in another very hard—almost entirely green—while the other two varied between the two extremes. When they had to deal with commercial articles such as mantles, of varying shape, and also with the eccentricities of fittings, it was indeed a troublesome matter to adjust incandescent burners to give the best results for the quantity of gas consumed.

Mr. J. W. Carmichael (Barrhead) considered that it was very difficult indeed to lay down any definite rule in regard to getting the best results from incandescent burners, as these were good, bad, and indifferent. Gas managers should advise consumers to get the very best burners—burners with the air and gas supply adjusted. The best results were obtained only when they had a green conical flame surrounded by a mauve flame. Mr. Newbigging's rule as to low-pressure would be quite right at the time it was laid down; but matters had changed considerably. So much gas being required now for cooking, heating, and power purposes was the reason why the pressure on the mains had been so much increased.

Mr. J. Fraser said the members must bear in mind that the system of laying and overhauling street-pipes was very different now from what it was twenty years ago. He had seen a piece of canvas covered with white lead put round a pipe, and had been told that it was quite good.

Mr. T. Wilson (Coatbridge) remarked that the probability was that in some instances where the pressure had been increased and the leakage had decreased, the consumption of gas through the

same length of main might have been trebled. In Coatbridge, in 1880, the highest pressure was 25-10ths. They were then passing 25 million cubic feet of gas. They were now sending through the same main, at 45-10ths pressure, 90 million cubic feet, with the result that the leakage was reduced from 26 to 6 per cent. He gave 45-10ths pressure at the works, but in the district the average pressure was from 24-10ths to 25-10ths. They were incorporated by Act of Parliament, and were restricted to a pressure of 5-10ths with a flat-flame burner.

The PRESIDENT asked if anyone had anything to say about inverted burners.

Mr. W. BLAIR remarked that his experience with these burners was the same as with vertical ones.

Mr. R. A. CAMPBELL (Provan) narrated that the previous day he had had an opportunity of seeing a number of tests carried out with vertical incandescent burners, passing 3 cubic feet of gas per hour. The lowest pressure turned out to be from 17-10ths to 19-10ths, and the light given was from 72 to 60 candles.

The PRESIDENT said that in high-pressure systems the pressure was from 10 to 40 inches, and the illuminating power ran up to 40 candles per cubic foot. He had recently had occasion to inspect the lighting in a foundry. They were working with old flat-flame iron burners, which had not been renewed for twelve or eighteen months, and had become choked. He tested one of them, and found it giving a light equivalent to about 4 candles. There was a very great difference between this and 40 candles per cubic foot. Members had enlarged upon the fact that with increased pressure there had been reduced leakage. Unfortunately he was not in this position. In his case, pressure had been increased from about 20-10ths to 35-10ths, and the leakage had gone up from about 12 to 15 per cent. They were finding out faults in the old main-pipes in the district.

The third question was—

What method of charging gives the best results—light charges at short intervals or heavier charges at longer intervals?

Mr. J. FRASER expressed the opinion that the class of coal and the method of carbonizing had a good deal to do with that question. In carbonizing cannel and splint coal, short periods would be the best method; but with coking coal he would prefer heavy charges and longer time.

Mr. J. A. ROBERTSON thought that the size of the retort should be considered.

Mr. J. NAPIER MYERS said this was the only subject on the *agenda* to which he gave any consideration previous to coming to the meeting. A few years ago, with a view to determining for himself which was the most profitable mode of charging—whether light charges at short intervals, or heavy charges at long intervals—he devoted most of the summer to finding this out. He carbonized at various yields per ton of coal, and noted the profit as carefully as he could. Those members who had attempted to do work of this kind would know how difficult it was to maintain exactly the same conditions in order to make the results comparable. He took due care to do this—that was to say, so far as maintaining the same kind of coal (the same mixture) and the same quality of gas was concerned—to the extent that his somewhat limited method of testing would admit. His method was that known as the durability test. He tested to yield from a little more than 9000 cubic feet per ton, with four-hour charges, to nearly 11,000 cubic feet per ton, from the same quality of coal, with six-hour charges. Naturally, one would expect that the profit would be very much more with the 11,000 cubic feet per ton than it would be when the yield was only 9000 cubic feet. He was very much surprised to find, however, that the profit per unit of gas (100 cubic feet) was very nearly the same. These testings were not for an hour or two, but in all cases extended over about a week. He might mention that during that summer the demand for coke was sufficient to clear out their stock every day. He took care, at the end of each week, to have no stock, so that he knew exactly how much coke he had for sale. The tests varied from 20 to 60 tons, and the results were as follows:—

Four Retorts with Four-Hour Charges.			*Eight Retorts with Six-Hour Charges.*		
Average Yield per Ton of Coal. Cubic Feet.	Profit per 100 Cubic Feet of Gas.	Yield per Mouthpiece per Day. Cubic Feet.	Average Yield per Ton of Coal. Cubic Feet.	Profit per 100 Cubic Feet of Gas.	Yield per Mouthpiece per Day. Cubic Feet.
9,500 ..	1·55d. ..	6875	10,900 ..	1·64d. ..	5800
9,892 ..	1·58 ..	7143	10,951 ..	1·63 ..	6256
10,220 ..	1·60 ..	7400	10,986 ..	1·65 ..	5834

They would see, by these results, that the extremes of these operations were nearly 1500 cubic feet of gas apart; but the difference in profit was only 0·1d., which was equivalent to 10d. per ton of coal. There would be collateral advantages in the larger charges with the longer time, which he thought would be in the saving of wear and tear of brickwork. But against this there would be a tendency to the extra deposition of carbon. The results of these operations confirmed him in the wisdom of carbonizing, at a comparatively low heat, a heavier charge for a longer time. In all cases he endeavoured to keep at 45 minutes' durability; and the illuminating power of the gas was 21 or 22 candles. In all cases it was Ayrshire coal that was used—from about Cumnock.

Mr. T. WILSON said his experience was that with a 9-feet retort they should never use a heavier charge than 2½ cwt. He considered 2 cwt. too low. They had stuffed-up ascension-pipes and increased carbon trouble with a duration of four hours.

Mr. J. MACLEOD said that the tests of Mr. Myers were somewhat puzzling to him, because they were absolutely contrary to any experience he had had in the matter—his getting roughly the same illuminating power with the one test as with the other. He himself made some tests with a coal (Lanemark cannel), taking off 8000, 10,000, and 11,800 cubic feet of gas. He began with an illuminating power of about 28 candles, and finished with something like 14 candles. The sperm value was also less with the higher yield of gas at a lower illuminating power than it was with a lower yield at a higher power. He did not think it was possible to take 1500 cubic feet more gas off a certain coal, and obtain anything approaching the same illuminating power. This he considered was absolutely contrary to experience.

Mr. J. W. CARMICHAEL said he had worked with four-hour charges, and always had very good results. Like Mr. MacLeod, he could not see how the illuminating power of the gas could be the same; but perhaps Mr. Myers put in a certain proportion of a better class of coal to keep up the quality. He never remembered making a large quantity of gas and getting the same illuminating power as he could with a small quantity. He really thought it better for smaller works to employ smaller charges, because with four-hour charges they might avoid firing up another oven. Four-hour charges gave them more gas than did six-hour charges.

Mr. J. BELL said his experience was something like Mr. Carmichael's. He had tested almost all the coal produced in Lanarkshire, and had got, with similar charges, a very much higher yield per ton; but the illuminating power was considerably lower. He did not think they would get away from the fact that with a higher yield, in running six hours, the illuminating power was bound to suffer.

The PRESIDENT asked whether the charges were of the same weight in both series of tests.

Mr. MYERS replied that they were 2½ cwt. with the four-hour and from 2¾ to 3 cwt. with the six-hour charges.

Mr. A. H. WHITELAW proposed that they continue the discussion upon this subject at the next meeting, because it was one upon which much could be said.

This was agreed to, and the proceedings closed.

COAL-STORE FIRES.

At the last meeting of the Brandenburg Association of Gas, Electrical, and Water Engineers, which was held at Berlin a short time ago, an animated discussion took place on the causes of the spontaneous heating of coal in store, and on the best methods of preventing the trouble. According to the "Journal für Gasbeleuchtung," the subject was introduced by Herr H. Pohmer, of Mariendorf, whose views did not gain the approval of the other members present.

Herr Pohmer expressed the opinion that a mass of coal contained a sufficient quantity of oxygen to oxidize the pyrites or that portion of the carbon which caused the heat. In Hanover, where for many years one and the same kind of coal had always been stored, partly under cover between high walls and partly in the open, fires had invariably occurred in the bunkers at places to which air had no access. The same remark applied to the stores at Düsseldorf. Hence it would appear that ventilation of coal was the only practical method for preventing spontaneous heating. It was, therefore, desirable that when the coal was built up into tall masses, passages and chimneys should be left within the material, or that it should be stored only in low heaps. The maximum safe height when air passages were not left was about 12 feet for Westphalian coal in bunkers, and 15 feet when stored in the open. Lump Silesian coal might be stored in masses of any height; fine could be safely stored to a height of 18 feet. Many varieties of English coal could also be stored to a depth of 18 feet. Herr Pohmer said he had no personal experience of the storage of Saar and Zwickau coals, but understood the former were stacked in Zurich to a height of 24 to 27 feet, although conditions there were such that the mass was ventilated.

Coals of unknown properties should always be kept separate from others, and should not be stacked higher than 12 feet. When space was limited and the coal had to be stored in higher masses, passages lined with wood or iron should be left; but the ventilation could not be depended upon to prevent heating if the passages were more than 12 or 15 feet apart. Many gas-works had abandoned the plan of leaving these passages, because fire had occurred in stores so ventilated; but Herr Pohmer considered that the reason for the fires was simply the insufficient number of the passages. Naturally, when once a fire broke out, the passages acted as chimneys. Large coal should never be stored near fine coal, for if a fire occurred among the small, the hollow places between the lumps in the stock of large material simply acted as chimneys. When the heaps of coal were very high, care should be taken that snow was removed quickly, for a coal prone to spontaneous heating appeared peculiarly liable to fire under a covering of snow. Numerous gas-works had given up the plan of ventilating coals owing to the weathering which took place when it was freely exposed to the air; and they, therefore, preferred to trust to iron tubes containing thermometers in different positions in the mass. If the thermometers were read

with sufficient frequency, any heating of the coal would be detected in time to allow the heap to be broken down before the fire spread. When a fire did break out, it was very necessary to avoid the use of water until the actual place of combustion had been reached.

At the conclusion of Herr Pohmer's speech, Herr Timme, the Manager of the Müllerstrasse Works in Berlin, expressed his disapproval of the plan of ventilating coal-stores. He described a fire that had taken place on his factory in a mass of lump Borsig coal stored in bunkers about 100 feet wide, and delivered into store from overhead railways roughly 22 feet above the floor level. The fire broke out among the large lump coal at a height of 6 feet above the floor, close to a cast-iron column supporting the railway and a 4-inch tube used for the insertion of a thermometer. There was no small coal at the spot; but the lumps were so large that there was plenty of natural ventilation. The fire had spread to the finer particles of the coal near, and had heated a neighbouring mass of English coal, separated from the rest of the material by a wall of Silesian lump coal. The flame penetrated the partition and attacked the English coal at one spot. The latter, however, refused to burn, though some of it was carbonized into excellent coke, which was surrounded with a solid mass of tar-like material. In former years Herr Timme had been in the habit of building his coal-stores with ventilating passages, but had abandoned the practice and now found it preferable to mix the coal before stacking it, so as to prevent the existence of cavities between the larger lumps. The plan of using sand and the like to extinguish a fire might be serviceable in cases where the store did not exceed some 1000 tons, but was scarcely applicable on a larger scale. If a fire broke out in a large store, the only thing to do was to remove the coal as quickly as possible and carbonize it at once.

Herr Gadamer, of Tegel, was quite unable to agree with Herr Pohmer's recommendation that coal should, for safety, be stored in low heaps. He had had fires in stores of English coal of perfectly normal composition which were only 5 feet deep, whereas other coals, stored to a height of 18 to 20 feet remained cold. Herr Kobbert, of Königsberg, stated that he invariably carbonized a particular variety of English coal which never contained more than 20 per cent. of smalls capable of passing through a 4 mm. sieve. He had had this coal under constant observation for ten years, stored firstly in ventilated heaps, secondly in the open air in unventilated masses, and thirdly in a proper store under cover and filled by machinery. In the old days, when he charged his bunkers by hand, and left passages for measuring the temperature and for ventilating the coal, he always found that heating occurred in just the places where the coal was wettest on delivery, and where, during the filling of the bunkers, the lumps had accumulated. Fires had also broken out underneath places where the roof of the store was no longer water-tight. When the same coal was stored in rectangular stacks in the open air, those portions of the heap which were packed so closely together that they could only be loosened by means of a pick, remained cold, whereas heating occurred where the lumps had congregated and the pile was more porous. When the new gas-works were ready and the same coal was stacked mechanically in a store covered by a metal roof, more serious heating broke out than had ever been experienced before. Although nominally the same, the coal contained rather less small. The floor of the store was from 3 ft. to 4 ft. 6 in. below ground level, and, according to the weather, the ground water rose and fell until the floor was sometimes wet and sometimes dry. In these conditions heating took place not only in spots where the heaps were 15 feet high, but at the bases of the natural angles formed by the coal. As the result of his observations, Herr Kobbert concluded that the chief obstacles to the safe storage of such a coal as he used were moisture and air, or, in other words, a high proportion of large lumps; but he did not consider that he had yet solved all the problems relating to the phenomenon. Herr Kobbert added that he had invariably analyzed his coal in case of fire, and had found that the proportion of sulphur present in the material which heated was quite identical with that in other parts of the store.

In the course of his reply to the discussion, Herr Pohmer said that he always used coal of moderate size in Hanover. He had never had a fire in the open air where the air had access to the store all round. It was quite true that low heaps of coal would heat if they were composed of fine coal. During the last few years many gas-works had been compelled to use low-grade coals and that was the cause of several fires. Very fine coal, such as that ground to powder for dust-firing, would heat when packed to a height of 12 inches. Referring to Herr Timme's experiments, Herr Pohmer believed that the fire broke out in the English coal and penetrated from there to the other part of the store. Herr Timme, however, interjected that his fire must have originated in the Borsig coal, for the heat did not penetrate to the English material until eight or ten days after the fire had broken out among the German coal.

Mr. Matthew W. Montgomery, who has been for some years Sub-Convener of the Gas Committee of the Glasgow Corporation, has been appointed Convener, in succession to Mr. Calderwood; and Mr. G. Stevenson has been reappointed Convener of the Gas Committee of the Dundee Corporation, and Mr. J. P. Crystal Convener of the Broughty Ferry Corporation Gas Committee.

REGISTER OF PATENTS.

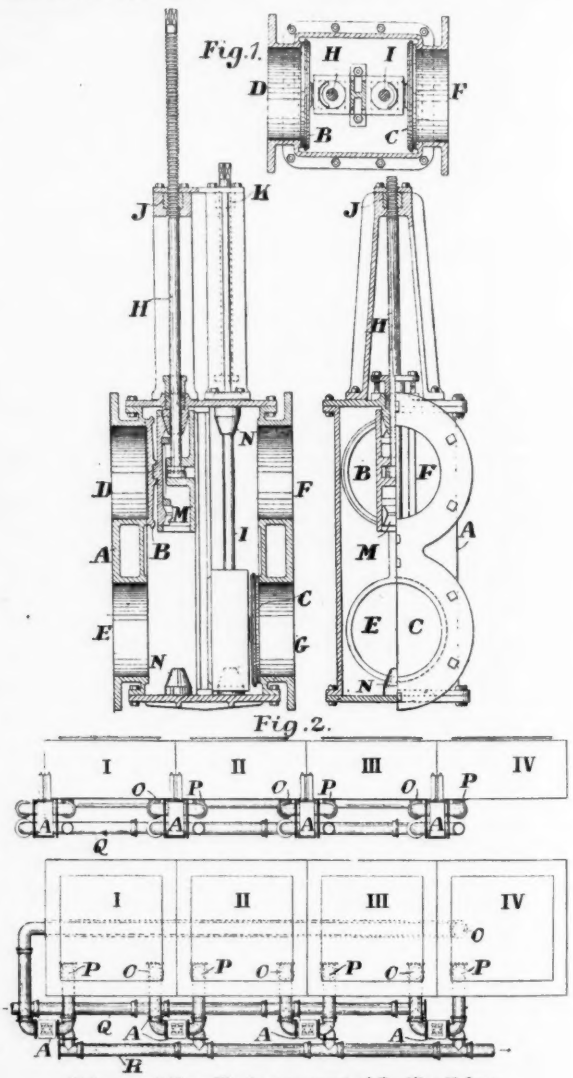
Controlling the Flow of Gas in Purifiers, &c.

HOLMES, P. F., and HOWELL, H., of Huddersfield.

No. 26,781; Nov. 26, 1906.

The principal object of this invention is to reduce the number of valves and connections necessary to accomplish the following purposes: 1. To enable the flow of gas to be directed through a set of purifiers in the required order. 2. To permit of an exchange of their respective functions between the inlet and outlet ends of a condenser. 3. To close the outlet of one of a pair of gasholders while ensuring that the outlet of the other remains open.

This the patentees propose to accomplish by arranging a slide valve or valves within a casing or valve-box provided with inlet and outlet ports, in such a manner that each valve is adapted to close alternately one or the other of two ports. It has previously been proposed to employ for similar purposes a casing having two slide valves and three or four parts separated by a diaphragm—either or both pairs of openings on different sides of the diaphragm being respectively opened or closed by means of the same door or valve—and an additional casing on each side communicating with the purifier, meter, or the like. But five of such valve-chambers were required in working four purifiers; while by the arrangement now to be described, by connecting one pipe to each port, it is possible to effect the same purpose with one valve chamber to each purifier.



Holmes and Howell's Arrangement of Purifier Valves.

Fig. 1 represents a valve-box in transverse section, in end elevation and cross section, and in sectional plan, with both valves in their lower positions. Fig. 2 illustrates in side elevation and plan a set of four purifiers with connections to such valve-boxes—the main outlet pipe being removed from the elevation.

The valve-box A has two valves B C and four ports D E F G, the flow of gas across the casing from port to port being only limited by the valves. The gas enters at the port E and leaves at the port F, or *vice versa*. The valve spindles H I are raised and lowered by screw-threaded upper ends working in nuts J K, or, to economize vertical space, telescopic screwed spindles might be employed. In conjunction with each valve inclined surfaces M are provided, adapted to engage cones N at the top and bottom of the box, for the purpose of causing the valves to make a tight joint when closed.

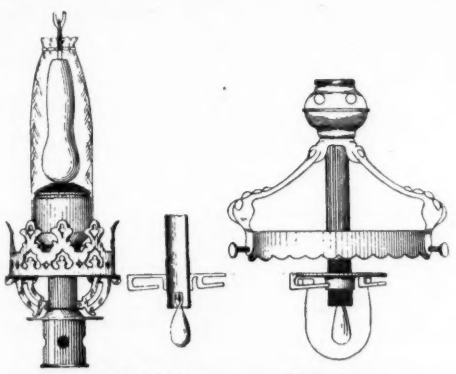
Each of the purifiers I, II, III, IV, has an outlet O and an inlet P communicating with the respective valve-boxes A, which are also each in communication with the main inlet pipe Q and the main outlet pipe R.

Incandescent Gas Mantles and Burners.

EADY, L. H., and E. W. H., of Southampton, and CASH, J., of Hove.
No. 26,768; Nov. 24, 1906.

To "increase the illuminating power for a given gas consumption of incandescent gas-lamp mantles of the types now generally used," the patentees propose to arrange entirely within the mantle a solid body of fire-clay, steatite, magnesian clay, asbestos, or mixtures of these materials or other suitable substance which will withstand the heat.

In place of the usual supporting rod there is provided a solid body which corresponds more or less to the shape of the mantle, and is of such a size and shape that an annular space of small radial width is left between it and the mantle, and that the usual aperture at the top of the mantle is not closed by it. The body is preferably of conical or tapering form, with a groove or fork at the top to receive an asbestos cross-thread by which the mantle is supported, and with a projection at the centre of its base to fit into the usual socket for the ordinary mantle-supporting rod.



Eady and Cash's Incandescent Light Improver.

In the upright type of burner, the body is, as shown, of somewhat tapering or pear shape, with a projection at the centre of its rounded base fitting the usual socket in the burner and with a forked or grooved projection at its upper part, which supports the cross-thread of the mantle.

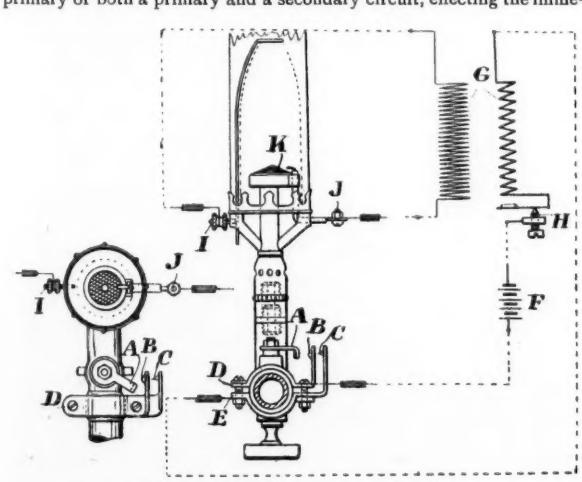
This arrangement is said to provide for "the proper combustion of the admixed gas and air within the mantle and the necessary draught through the aperture at the top; while it causes intense incandescence of the mantle."

In a lamp with an ordinary inverted mantle, the body of heat-resisting material is supported centrally within the mantle. It is more or less pear-shaped, and is supported with its pointed end just within the mouth of the burner-tube. The patentees conclude their specification by saying: "It is found that with bodies such as described the illuminating power given by the mantle is increased or the same illuminating power obtained with a reduced quantity of gas; that the noise produced by combustion is reduced; and, in the case of an upright mantle, that it is kept steady and prevented from knocking against the burner when exposed to draughts, as in public lighting—thereby prolonging the life of the mantle. We are aware that it has been proposed to arrange bodies in upright incandescent mantles—such bodies sometimes being hollow, sometimes being formed with horizontal faces to arrest the upward flow of combustible mixture, and sometimes being formed of solid copper and adapted to conduct heat to petrol vaporizing tubes connected therewith; but so far as we know, such arrangements are not in practical use and are outside the scope of our invention."

Lighting and Extinguishing Gas-Burners.

FISCHER, J., of Pozsony, Hungary.
No. 7358; March 27, 1907.

This electric ignitor for gas-burners is of the type in which, when the gas-cock is opened, an electric contact device thereon closes either a primary or both a primary and a secondary circuit, effecting the immediate ignition of the outflowing gas. The invention consists in insulating the body of the burner from the gas-supply pipe, and in certain details of construction.



Fischer's Lamp Lighter and Extinguisher.

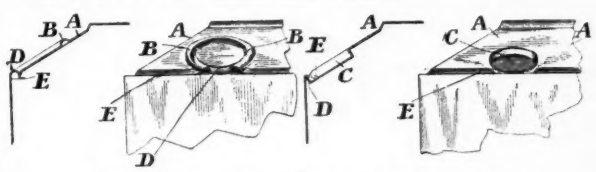
To the gas-cock is attached a switch-arm A, which, when the cock is opened, presses the contact B against the contact C, which is fixed on a spring plate mounted upon, but insulated from, the gas-pipe by a clip consisting of two curved portions D E insulated from each other, and connected with the two poles of the battery F through the interpolated induction coil G, the primary winding of which is provided with an automatic contact-breaker H. One end of the secondary winding of the coil is connected at I to the metallic body of the burner, and the other end at J to a strip of metal arranged adjacent to the burner, but insulated from it by a covering.

Whenever the cock is opened, even to a slight extent only, the arm A closes the contact device B C, and thus energizes the coil and causes it to produce at K sparks that ignite the escaping mixture of gas and air. As soon as the cock is completely opened, the primary circuit is again broken. The gas-supply pipe is used for the supply of the primary or secondary current; and instead of making use of the contact shown, the primary circuit may be closed by means of the arm A. If there is more than one burner, the spark-gaps of the burners may be connected in series in such manner that when any cock is opened the sparks leap at every burner.

Gas-Meters.

GLOVER, T., of Queen Victoria Street, E.C.
No. 203; Jan. 3, 1907.

This invention relates to the means employed in sealing the top of a gas-meter to the gallery or sides by the officials appointed under the Sale of Gas Acts, after the meter has been tested, and previous to being used. According to the present system, a disc of metal having a raised edge has been soldered to the top and gallery or sides of the meter; and if the meter is found by the officials to work satisfactorily, the disc of metal has their seal impressed in wax; so that should any attempt be made to remove the top of the meter it can be detected.



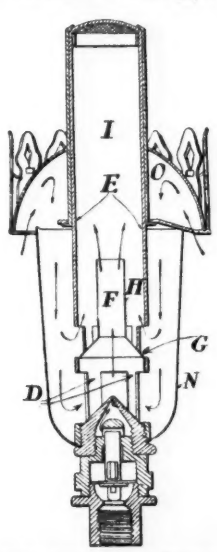
Glover's Meter-Sealing Attachment to Gas-Meters.

As this system involves extra labour and expense, the patentee proposes to dispense with the disc of metal and stamp or otherwise form in the top A one or more ridges or recesses C, as in the alternative arrangement shown. He also arranges to stamp, emboss, or otherwise form a portion D on the gallery E to correspond with the ridge B, or recesses C. The officials would then apply the wax to the recess C, or within the ridge B in the top A, and thus the two parts A and E are sealed together.

Incandescent Gas-Burner.

VIEU, R. M., of Paris.
No. 15,543; July 5, 1907. Date claimed under International Convention, July 7, 1906.

As shown, this burner comprises a regulator, to the upper part of which is screwed a conical nipple provided with a small orifice. On the nipple is fitted a small "lantern" D, forming part of a metallic tube E



Vieu's Incandescent Burner.

Above the openings of the lantern, and in the interior of the tube, is arranged the first mixing-chamber F, formed by a truncated metal cone G surmounted by a tube H, through which passes the mixture of gas and air before entering a second chamber I, formed by the tube E. This is provided, above the cone G, with a certain number of openings permitting air to enter the chamber. The upper part of the tube is fitted into another tube, the upper opening of which is closed by the usual metallic gauze at top. The mixing-chambers F and I are enclosed by a metal casing N, into which the air enters before passing into the chambers. This casing is closed at its lower end, which rests on a flange provided for the purpose on the burner-cone and fixedly held by

the base of the lantern D. The upper part of the casing N is open, and forms, with the metal cap, a reservoir O in which the air, passing through openings under the cap, is stored before going into the interior of the casing.

The gas on entering draws with it by injection the air which has passed into the reservoir O, and thence into the chamber formed by the casing N. Passing through the openings in the lantern D, it mixes with the gas in the first chamber F. The nozzle very quickly raises to a high temperature the air passing into the interior of the chambers O and F and from the chamber formed by the casing N. At its exit from the nipple, the gas expands in contact with the warm air which it draws in by injection, "thus producing an intimate mixture," which is compressed in the tube H and passes through the upper orifice. The velocity of the mixture, which was slow in the lower part of the chamber F, increases in the cylindrical part of it, where the gaseous current undergoes contraction, which causes at the outlet from the chamber a second inflow of air, which increases the quantity of air contained in the mixture. This second mixture is produced in the upper part of the chamber I, where, "by its expansion and the diffusion of its molecules," it is in proper condition to be brought to the mantle.

Gasholders.

CLAYTON, L., and PICKERING, J. R., of Hunslet, near Leeds.

No. 12,809; June 3, 1907.

This invention relates to spiral guided gasholders, in which spiral rails on the face of the holder are employed in conjunction with runners on the holder tank and on the various dips of the holder for supporting and guiding the holder when working.

Fig. 1.

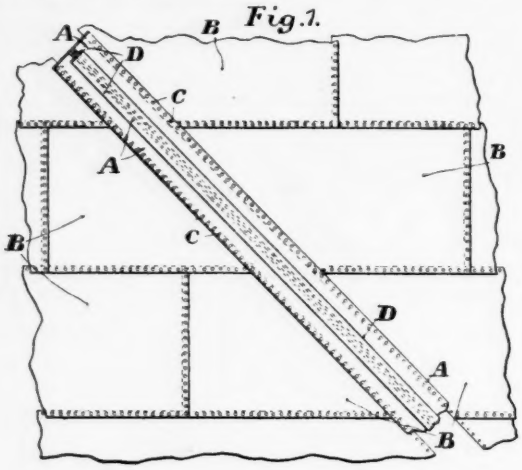


Fig. 2.

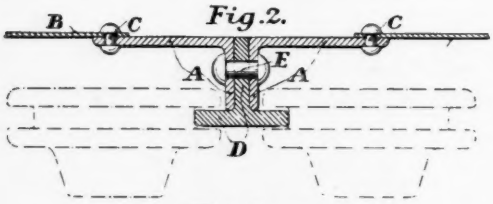


Fig. 3.

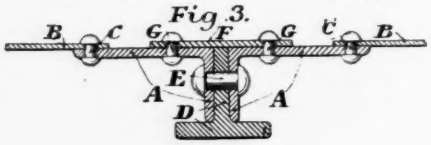


Fig. 4.

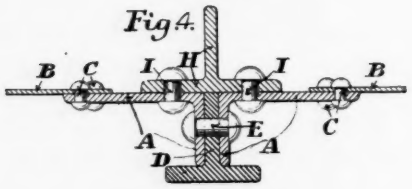
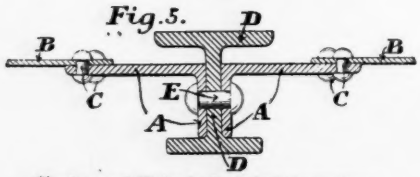


Fig. 5.



Clayton and Pickering's Spiral Gasholders.

It has hitherto been customary, the patentees point out, to attach the spiral guide-rails to the face of the holders by fixing them to vertically or horizontally placed flat plates attached directly to the adjacent and ordinary plates of the holder, or by fixing the rails to diagonally or spirally placed flat plates connected to the adjacent and ordinary plates of the holder. But these arrangements are said to be not "entirely satisfactory in practice," owing to the fact that the rails, "which have usually been of I-section, are connected by their base flanges, and consequently ineffectually supported near their heads or working flanges."

The object of the present invention is "to attach spiral guide-rails to gasholders in such a manner as to give increased support to such rails and additional stability to the holder itself," by dispensing with the flat attaching plates hitherto used, and in lieu thereof employing two angle plates placed diagonally or spirally upon, and riveted to, the adjacent and ordinary plates of the holder with their forwardly projecting members opposite each other; while between these forwardly projecting members of the two angle plates is inserted a guide-rail of T-section, fixed in position by rivets passed directly through the projecting members of the two angle plates and the web of the rail, "whereby increased support is given to the rail and additional stability imparted to the holder."

The inner end of the web of the T-rail is preferably made flush with the inner surfaces of the two angle plates. The joint on the inside of the holder where the end of the rail and the two plates meet may be covered either by a flat plate or by a T-plate; or the spiral rail may be of I-section, in which case the web of the rail is fixed between the projecting members of the two angle plates, while the inner flange of the rail is left free and projecting within the holder.

Fig. 1 is an elevation of a portion of a holder, showing a number of the adjacent and ordinary plates of the holder having attached to it a guide-rail in accordance with this invention. Fig 2 is a sectional plan, representing the same guide-rail and two of the adjacent and ordinary plates of the holder, drawn to a larger scale. Figs. 3, 4, and 5 are similar views, showing constructional modifications.

As shown in figs. 1 and 2, two angle plates A are placed diagonally or spirally upon, and attached to, the adjacent and ordinary plates B of the holder by means of rivets C; while between the forwardly projecting members of the angle plates is inserted a guide-rail D of T-section, fixed in position by rivets E passed directly through the web of the rail and the embracing members of the angle plates, "whereby increased support is given to the rail D and additional stability imparted to the holder."

For small holders, the inner end of the web of the rail is preferably made flush with the inner surfaces of the angle plates, as in figs. 1 and 2; while for larger sizes of holders, the joint on the inside of the holder, where the end of the rail D and the angle plates A meet, can be stiffened and strengthened, either by attaching a flat plate F to the angle plates, by means of rivets G as shown at fig. 3, or by attaching a T-plate H to the angle plates by means of rivets I, as shown at fig. 4. In the case of large, deep holders, the rail D can be of I-section; the web of the rail being fixed between the embracing members of the angle plates with the inner flange of the rail left free and projecting within the holder, as shown at fig. 5.

APPLICATIONS FOR LETTERS PATENT.

23,166.—BEELEY, W., "Locking device for the protection of mantles." Oct. 21.

23,178.—KERSHAW, P. B. W., "Production of gases by internal combustion." Oct. 21.

23,192.—SOCIÉTÉ ANONYME WESTINGHOUSE and LEBLANC, M., "Jet condensers." Oct. 21.

23,197.—STERN, M., "Gas-fittings." Oct. 21.

23,200.—IMRAY, O., "Heating burners." A communication from Carl Kaltschmid. Oct. 21.

23,202.—HANSFORD, J., and GIBBONS, W. P., "Manufacture of gas and coke." Oct. 21.

23,236.—SANDMANN, F. W., "Gas-generators." Oct. 21.

23,259.—THORP, T., "Rotary blowers and pumps." Oct. 22.

23,267.—BRAY, J. W., "Inverted burners." Oct. 22.

23,275.—SPEYER, A., "Valves." Oct. 22.

23,330.—PEAT, J. B., and BONIN, H., "Subjecting gases to the action of liquids." Oct. 22.

23,414.—PARKINSON, B. R., and WOODALL, H., "Securing the ends of service-pipes to gas or other mains." Oct. 23.

23,457.—FLETCHER, RUSSELL, AND CO., LTD., NEIL, A., and FLETCHER, T. W., "Gas and water valve." Oct. 24.

23,458.—FLETCHER, RUSSELL, AND CO., LTD., NEIL, A., and FLETCHER, T. W., "Automatic gas cut-off or regulator." Oct. 24.

23,537.—DEWEY, H., "Mantles." Oct. 25.

23,591.—PARKER, T., "Improvements in heating systems." Oct. 25.

23,629.—FURCH, A., "Ball-and-socket joints for gas-pipes." Oct. 25.

23,662.—M'LEAY, A. T., "Fluid pressure rotary engines, pumps, or air compressors." Oct. 26.

23,679.—WHITFIELD, C., "Power-gas producing plant." Oct. 26.

23,712.—PERITZ, W., and LYLD, J., "Retorts." Oct. 26.

23,802.—KENT, T. F., "Inverted burners." Oct. 28.

23,830.—HAWLEY, W., "Purifier grids." Oct. 29.

23,846.—ROTHSTEIN, A., "Several-ways valve." Oct. 29.

23,879.—FESSARD, A., and BRACHMANN, J., "Metallic packing for pipe joints." Oct. 29.

23,989.—COX, V. W., and OLSSON, M. C., "Gas-fired kilns." Oct 30.

23,996.—FÉRY, C., "Calorimeters." Oct. 30.

24,010.—TOURTEL, J. M., and MEALING, W. R., "Gas-controlling appliances." Oct. 30.

24,018.—OPPENHEIMER., J., "Ball-and-socket joints for gas-pipes." Oct. 30.

24,070.—BRAY, J. W., "Vertical inverted burners." Oct. 31.

24,077.—SHACKLETON, J., "Gas-engines." Oct. 31.

24,175.—CROFT, C. J., and BOUTS, T., "Rotary gas-engines, air-compressors, pumps, and the like." Nov. 1.

At a recent meeting of the Stourbridge Urban District Council, a recommendation by the Gas Committee that an advance of £25 per annum for the next four years be granted to the Gas Engineer and Manager (Mr. C. H. Webb), under an agreement by which he would agree to stay with the Council during the period named, was adopted.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Auction Clauses in the Model Gas Bill.

SIR,—I should feel much obliged if you would grant me a little space in which to offer a few brief remarks upon the Auction Clauses provisions of the Model Gas Bill.

The clause which prescribes that new shares or stock shall be offered by auction or tender is as follows: "Notwithstanding anything in this Act contained, the company shall, when any shares or stock created under the powers of this Act are to be issued, and before offering the same to the holder of any other shares or stock in the company, and whether the ordinary shares or stock of the company are or is at a premium or not, offer the same by public auction or by tender in such manner, at such times, and subject to such conditions of sale as the company shall from time to time determine: Provided that at any such sale no single lot shall comprise more than one hundred pounds nominal value of shares or stock, *and that the reserved price put upon such shares or stock shall not be less than the nominal amount thereof*," &c. The clause expressly recognizes the propriety of leaving to the Directors of a company a wide discretion as to the manner, the time, and the general conditions of a new issue; but at the same time it imposes upon them a singular restriction in the words which I have italicized. I shall endeavour to show that this restriction—conceived originally, perhaps, to be a protection of the interests of the public—is not only valueless, but positively detrimental to those interests. It causes useless delay and expense; and as the expenditure incurred by the company falls ultimately upon the consumers, they are the sufferers by it.

The restriction is, of course, based upon some principle, and this principle appears to be that stock ought not to be issued at a price below par. But the restriction does not prevent an issue below par; it only postpones it. For a subsequent clause in the Bill proceeds to enact: "When any shares or stock created under the powers of this Act have been offered for sale by auction or tender, and not sold, the same shall be offered at the reserved price put upon the same respectively for the purpose of sale by auction or tender, to the holders of ordinary shares or ordinary stock of the company in manner provided by the Companies Clauses Act, 1863: Provided always that any shares or stocks so offered and not accepted within the time prescribed by the said Act shall again be offered for sale by public auction or by tender, in the manner and subject to the provisions of this Act with respect to the sale of shares or stock created under the powers of this Act, and *the reserve put upon such stock may, upon such second auction or tender, if the Directors think fit, be less than the nominal amount thereof*," &c.

Now let us see how all this works out. Let us take the very ordinary case of Directors having to raise further capital by the issue of (say) 4½ per cent. stock, the existing issue of which stock stands at (say) the price of 90. They have first to go through the futile formality of offering the new issue to the public at not below par, well knowing that they will not get a single bid. When this barren result has been achieved, they have then to play the second act of this tragi-comedy, and to offer the new issue at not below par to their shareholders, who have already, as members of the public, had it offered to them, and have declined it. Naturally, they decline it again; for stock which is hawked about without attracting a bid does not improve in demand. At last—and not till now—are the Directors in a position to take the one and only businesslike course of selling the new issue at its fair market value; and lucky are they if they succeed in getting good value, for perhaps the issue has by this time become a little tainted, and a public unacquainted with the mysteries of a Model Gas Bill fight shy of it. Meanwhile, the company has been hampered, perhaps, by want of means; but auctioneers, printers, advertising media, and others have made profits which the consumers will have to defray ultimately.

I ask, Why, if Directors can be trusted to fix the manner, the times, and the conditions of sale, according to what they believe to be the best advantage of the company, should they not be trusted to fix at the same time the best price they think they can get? But, as a matter of fact, Parliament has, in several concrete cases, assented to the elimination of the "not below par" clause from a company's Bill. When my Company went to Parliament in 1902, we eliminated from our Bill the "not below par" clause; and the Bill in the form deposited passed the Committees of both Houses without any question on the point having been raised. The clause was excluded with the like result from the South Suburban Gas Bill of 1904, the Tottenham and Edmonton Gas Bill of 1906, and, I believe, many others which I cannot at the moment call to mind.

As to the public impolicy of attempting to prescribe fictitious values for what must ultimately be appraised by the higgling of the market, it is significant that the "not below par" clause in section 21 of the Companies Clauses Act, 1863, in regard to new issues was so soon found to be unsound that in the like Act of 1869 it was expressly repealed.

I trust these observations may possess some interest for parties who may be going to Parliament next session for further capital powers.

H. D. ELLIS.

Commercial Gas-Works, Nov. 9, 1907.

The Coalite Process.

SIR,—Like Mr. Marshall, I am a gas-maker technically interested in the Coalite process, and from this point of view find his contribution to the discussion of very little value.

Mr. Marshall assumes "that the clever men employed in searching" &c., &c., and again that "such men as compose the Coalite directorate would never" &c., &c. Such "assumptions" do not help in what is presumably a technical and impartial discussion of the process.

When Mr. Marshall comes to figures, however, we should expect to find something which appeals more strongly to the technical mind. But here again there are so many assumptions that the "assumed" profit of £107,800 from the benzol, ammonia, and tar alone requires considerable substantiation before we can accept it. On the same basis, and with the same fine disregard of such matters as costs, &c., we might without difficulty show equally good profits for the ordinary gas-works process.

Thus for the ½ gallon of crude benzol per 1000 cubic feet on a yield of 5000 feet per ton that Mr. Marshall claims for Coalite, there are plenty of gas-works that could show ½ gallon per 1000 cubic feet on a 10,000 cubic feet make. Similarly for his 20 lbs. of sulphate, 30 lbs. are often obtained; and against his 15 gallons of tar, 12 gallons is quite an ordinary yield. And yet the gas-works are not exactly the "mines of wealth" Mr. Marshall claims for the Coalite process.

On the point referring to the use of the Coalite gas as an auxiliary instead of water gas, there is much that might be said. Mr. Marshall's proposal would not only take away the great advantage we now possess of controlling the output of coke, but would lay upon us the additional burden of finding a market for extra coke when coke is most plentiful. The other advantages of the water-gas plant—its elasticity, &c.—need not be enlarged on here. Imagine the delight (?) of the harassed gas manager when he turns to his Coalite plant for assistance in a mid-winter fog—a big demand on for gas, his holders down, coal scarce, and his yard already full of coke.

Mr. Marshall talks of the "mere nominal production of benzol from coke-oven plants," &c. He apparently does not know that this already amounts to many million gallons per annum, and is rapidly increasing—at a much quicker rate than the demand. Indeed, producers are at present puzzled to find fresh outlets, and would be delighted to see the 3d. per gallon profit so easily "assumed" by Mr. Marshall. As a matter of fact, the yield of benzol per ton of coal from bye-product coke-ovens is more than that claimed for the Coalite process. So much then for the "vast possibilities" in this respect.

May I, Sir, suggest to Mr. Marshall that his desire to throw light upon this subject will be better served by discussing it a little more technically, and a little less on the lines of the Coalite prospectus?

The reading of Mr. Marshall's letter rather inclines the technical gas maker to dismiss the matter with the passing thought that it is surprising the promoters did not develop a little "mine of wealth" on their own account, instead of so generously electing to share their great discovery with the public.

M.INST.C.E.

I enclose my card.

Nov. 8, 1907.

SIR,—Is "Coalite" a patentable product? Is "Coalite" to be produced by a patentable process? Both questions seem to be premature—the very question to be put is: Can anything like regular coalite be produced without extravagant cost for fuel, labour, maintenance of works, and capital charges?

In my opinion if ever the Coalite Company give proof that they can do it, they will have taught us gas men a very profitable lesson, for which they will be entitled to large remuneration. If they do not teach us the lesson—well, they will teach their shareholders once more that——But that is their affair.

J. D. B.

Nov. 9, 1907.

Tar-Spreading Competition.

SIR,—I have read the Judges' report and your article thereon in the last issue of the "JOURNAL."

The report states that the tar supplied by the Reading Gas Company was inferior for road purposes to that supplied by the South Metropolitan Gas Company; also that it was "apparently unsuitable for spraying machines, probably owing to the foreign matter which it contained when it arrived in the tanks at Ascot. In your article, you ask why the Reading tar is inferior for this purpose. The explanation is as follows.

Mr. Rees Jeffreys, the Secretary of the Roads Improvement Association, wrote and asked us to deliver a quantity of tar at Ascot for these tests; but he had considerable difficulty in obtaining the necessary tank-waggons for its conveyance, and it was not until the last moment that Mr. Maybury, the Kent County Surveyor, forwarded a number of small tank-waggons. These had to be loaded in a great hurry in order to get them to the site in time for the tests.

I was present at Ascot when our tar was being used on the roads, and Mr. W. J. A. Butterfield, F.I.C., who was advising the Roads Improvement Association, asked me how it was that our tar contained such a large amount of fibrous matter, some portions of which he showed me. At that moment our tar was being tried in Mr. Reeson's tar-spreading machine, which, unlike other machines in use there, distributed the tar under a very low pressure. The tar would not run from the holes in the distributing pipe; and I asked Mr. Reeson to have it disconnected. This was done; and we found that the tar in the pipe and in the tank contained a quantity of material which had evidently been used for "bung cloths," and was in the tanks when they were forwarded to Reading—these tanks having been previously loaded (elsewhere) from tar-barrels.

I think the above explanation will account for the apparent inferiority of Reading tar for use on the highway.

D. H. HELPS,
Engineer and Manager of the
Reading Gas Company.

Reading, Nov. 8, 1907.

SIR,—Mr. D. H. Helps has forwarded me a copy of the letter he has addressed to you for publication in the "JOURNAL."

He refers to my conversation with him at Ascot, as to the fibrous material in the tar which prevented the tar-spreading machines handling the Reading tar satisfactorily. I gladly confirm his explanation, that the fibrous material was evidently derived from old "bung cloths" which must have been in the tanks before the Reading tar was loaded into them. I have personally no doubt that many of the machines would have spread the Reading tar in a perfectly satisfactory manner had this extraneous material—which it is inconceivable was present

in the tar before it was loaded into the tank waggons—not become incorporated with it.

I do not feel called upon to defend statements made in the report of the Trials' Judges as a body; and as Mr. Helps has given the reason why the Reading tar has proved unsatisfactory in the spreading machines, perhaps it would be politic not to refer further to the alleged inferiority of that tar. But it is obvious that, as crude gas tars vary widely in density and composition, that from one works may be more efficient as a road-coating material than that from another works. In my view, the gas tar for which the distiller can afford to give the best price is generally likely to be most efficient for road treatment—an unfortunate coincidence. But it is only a question of degree. There is probably no gas tar which will not treat road surfaces satisfactorily, provided it is applied in proper quantity and in a proper manner. It is in respect of ease of application and quantity required per unit-area of road surface that the prepared, refined and crude tars become differentiated. Properly applied, I have little doubt that the Reading tar will coat a road surface as satisfactorily as any other crude or most prepared coal tars. It is a question of cost as apportioned between the price per gallon, the area covered by a gallon, and the expense of application; and, in regard to the last two items, Reading gas tar probably occupies an intermediate position among crude coal tars.

This is merely an expression of my personal views; and I cannot say whether any of my colleagues on the Judges' Committee for the recent competitions would agree with it.

W. J. Atkinson Butterfield.

Westminster, Nov. 11, 1907.

Uniformity of Testing.

Sir,—In connection with the above subject, I think it is most important and necessary to point out to the gas profession that there are two other argand burners in existence which do more justice to all qualities of gas than is done by the use of the "Metropolitan" No. 2 burner. There is no doubt it would be an admirable thing to have a uniform method of testing all gases supplied in the kingdom; but, considering the many places, gases, and existing powers this would affect, it is scarcely reasonable to expect that gas undertakings will spend on Bills money they can ill-afford in order to secure such a method, unless it is certain to be of benefit to them individually.

Many companies are working under clauses which provide only for an "argand burner having 15 holes and a 7-inch chimney, and consuming 5 cubic feet of gas an hour." Now, since the No. 2 burner does not comply with these restrictions, I have a burner which not only complies in every way with the parliamentary requirement, but yields far higher results than is possible even with the Metropolitan argand. This may seem impossible; but I go further, and say that when working under similar conditions the old No. 1 "London" argand yields more than a candle above the Metropolitan, while my burners return another 1½ candles. With carburetted water gas, this burner is from 2 to 4 candles ahead of the Metropolitan burner. Now, considering these results, it can scarcely be claimed that the London official burner represents the true and maximum value of the gas under examination, as provided for by both old and modern Acts of Parliament. Greater uniformity can be secured by using burners which will return the maximum light of the gas; and it matters very little what burner is employed, so long as this one great object is secured alike for testing as for the consumer's use.

It is my endeavour to serve the gas industry in the best possible way; and as it is to the advantage of that industry to have only the best burner, I have taken the liberty of writing to make known the existence of these burners. The future of the industry lies in the adoption of the best burner in any Bill, with the insertion of a provision to allow of the adoption of a better burner should it be found.

W. Grafton.

Nov. 9, 1907.

Christmas Presents.

Sir,—The letter which the Attorney-General sent to some correspondents a few weeks ago, on the subject of Christmas presents, seems to have led to some doubt in the public mind. There can be no doubt that the Attorney-General's remark, that "Christmas presents which really have that character, and are openly and honestly given as such, cannot be within the Act" (Prevention of Corruption Act, 1906), is entirely right; but, as Sir Edward Fry, the President of the Secret Commissions and Bribery Prevention League, writes, "the question remains as to what is open and what is honest, and I would not advise anyone to think that Christmas boxes given to the servants of a customer are always either open or honest."

The words of the Prevention of Corruption Act may be fittingly recalled: "If any person corruptly gives or agrees to give or offers any gift or consideration to any agent as an inducement for doing or forbearing to do, or for having after the passing of this Act done or forborne to do, any act in relation to his principal's affairs or business," he shall be liable on conviction on indictment to two years' imprisonment or a fine of £500, or to both imprisonment and fine, or on summary conviction to four months' imprisonment, or a fine of £50 or both.

The Committee of the League, which is being constantly consulted on this subject, is of opinion that it would be extremely difficult, in case of any prosecution, for any giver of Christmas boxes to agents who have not first obtained their employers' consent, to prove that they were not given with an intention which is corrupt within the meaning of the Act.

No one in his senses would desire to stop the practice of giving Christmas boxes in ordinary circumstances; but there is a very strong feeling in all parts of the country (judging from the letters which reach me daily), that the giving of presents to customers' representatives—buyers, in particular—amounts in most cases to a bribe, unless the presents are given with the knowledge and consent of the principals concerned.

R. M. Leonard, Secretary,
Secret Commissions and Bribery Prevention League.

3, *Oxford Court, Cannon Street, E.C., Nov.* 8, 1907.

LEGAL INTELLIGENCE.

SHOREDITCH COUNTY COURT.—Monday, Nov. 4.

(*Before Deputy-Judge* Herbert Williams *and a Jury*).

Sequel to the Hoxton Gas-Poisoning Case—Damages Awarded to Sufferers.

As briefly reported in the "Journal" last week (p. 444), his Honour had before him a claim made against the Gaslight and Coke Company by Charles Lawrence, Isabella Lawrence (his wife), and their infant daughter Annie, residing at No. 2, Louisa Street, Hoxton, for £100, damages for injury caused by being poisoned by gas in the early hours of the morning of the 24th of May last. It may be remembered that altogether ten persons were affected—six at No. 1, Louisa Street, the three plaintiffs in the present action, and a younger child, who was not seriously injured, and for whom no claim was entered. The accident resulted in the death of one of the sufferers (Mrs. Choate); and at the Coroner's inquest the medical evidence was to the effect that it was caused by "poisoning from gas fumes." A verdict of "Accidental death" was, however, returned.*

Mr. Scarlett appeared for the plaintiffs; Mr. Neilson (instructed by Messrs. Monier-Williams and Robinson) represented the Company.

Mr. Scarlett, in opening the case, said it was of great importance to borough councils, gas companies, and the general public. Last May the Shoreditch Borough Council were carrying out road improvements in Louisa Street as well as in one or two streets adjoining; and for this purpose they had been using an ordinary 10-ton steam-roller. Underneath the street were the gas-mains, at a depth, he believed, of 23 inches; and they had, it appeared, been laid in 1870 by a gas company who were predecessors of the defendants. His contention was that if these mains had been securely and tightly laid in proper soil nothing could have happened; but he had evidence to show that there was a subsidence under a portion of a main, and that in passing over this the steam-roller had caused a break, and a leakage of gas. The result of this was that the plaintiff and his wife and children were poisoned, and had suffered from the effects almost ever since. So far as could be ascertained, there had not been any inspection of the mains since they were first laid—a period of nearly forty years; and he submitted that this was clearly negligence. On the afternoon of the 23rd of May, a strong smell of gas was detected; but nobody took any notice of it, and no one from the Gas Company came to see what was the matter. The men who had been carrying out the work had all had great experience with cracked gas-pipes; and one would have thought that the most ordinary precaution would have prevented the dire calamity that followed. It had been suggested that the plaintiffs were wrong in bringing an action against the Gas Company; but he submitted that this was not so. The Company carried on a dangerous trade, and they knew very well that if any gas escaped they endangered the lives of people; and therefore it was for them to make some arrangement with the borough councils or other local authorities, so that they could be in touch with any street repairing that was going on, and have inspectors on the spot to see that no mischief was caused by steam-rollers. If the Company felt that the Borough Council were responsible for having broken their main, they had a remedy; but, so far as he was concerned, he went for those who had not used proper care in carrying on their trade. On the morning of the 24th of May, the plaintiff found his wife and one of his children unconscious, and they were taken to the hospital, where the wife had to remain for three weeks, and was even now an out-patient; while the child was laid up for a long time. The father was rendered so ill that for some weeks he was unable to follow his occupation. In conclusion, Counsel submitted that the persons who were liable were the Gas Company; and if they wanted to settle any differences between themselves and the Borough Council, that was a matter for them afterwards. It was obvious the earth had not been properly packed under the main, or the subsidence would not have been caused; and this, he contended, was negligence for which defendants were responsible.

Mr. *Charles Lawrence* was then called. He stated that at four o'clock in the afternoon of the 23rd of May he detected a strong smell of gas, which he considered came from the drains by way of a leaking pipe. He went all over the house to see if he could find any leakage; and failing to do so, the family retired to bed at about ten o'clock. During the night his wife kept waking up and complaining of the strong smell of gas; and at half-past five he was roused by her shouting to him from downstairs. The smell of gas was then overpowering; and he at once ran to open the windows. On going downstairs he found his wife and child unconscious, and took them to the hospital. His wife always enjoyed good health; but now she was low-spirited and anæmic.

Mrs. *Isabella Lawrence* also gave evidence in regard to the strong smell of gas, and said that she suffered with headaches and had been ill ever since the accident.

Dr. *Williams*, of the Metropolitan Hospital, Kingsland, stated that all the patients admitted were suffering from carbon monoxide poisoning. He had never had experience of such cases before, as they were rather rare. Even if persons did not die, he was of opinion that sometimes they never recovered from the effects. He considered that the headaches, anæmia, and general debility from which Mrs. Lawrence was suffering were due to the after-effects of the poison.

Dr. *Henry Bird* said that though Mr. Lawrence was now quite capable of doing his work, he had developed a form of bronchial catarrh from the irritation of the gas poisoning, and he also suffered from nervousness.

Two witnesses were called who stated that at about nine o'clock on the morning of the 24th of May they were on their way to work and saw a cracked pipe removed from outside Nos. 1 and 2, Louisa Street. They were both positive that there was a boat-shaped hole under the gas-main, where the earth had subsided.

* See "Journal," Vol. XCVIII., p. 681.

Mr. *Scammell*, a member of a firm of civil engineers, testified that an iron pipe 23 inches deep in the ground would not break with a weight of 50 tons, unless the soil was bad or the main had been improperly laid. He said he had known of many mains breaking, but not if they had been properly laid.

Mr. NEILSON: I put it to you that it happens continuously when a steam-roller is at work.

Witness: I certainly say no, if the main is laid properly in good soil.

Mr. SCARLETT: I say it is a matter of common knowledge that these gas-mains do break; and I ask, would it be unreasonable for gas companies to arrange with borough councils to have an inspector on the road?

His HONOUR remarked that this was a question for the Jury. He then put a question to the witness and elicited the answer that the pipe referred to was a good one.

This closed the plaintiffs' case.

Mr. NEILSON then asked to be allowed to address the Jury at this uncture as well as later on, as he desired to let them see exactly what his case was.

No objection being raised,

Mr. NEILSON said that the Gas Company attached the greatest importance to the case, owing to the many issues involved. Moreover, there were a number of other cases pending in connection with the matter. The Company were fighting the case on the principle that they were not liable, but the Borough Council; and, as a matter of fact, who else could be liable? There was no doubt that this unfortunate escape of gas occurred, and that these persons suffered serious injury; and nobody regretted this more than the Company. They were nevertheless compelled to resist any attempt to shift the responsibility of a Borough Council on to their shoulders. If he had read the claim rightly, the Company were there because it was suggested that they had been negligent. But this was exactly why they were there—to prove to the whole world that they had not been negligent in a single thing, and had done nothing, and had neglected to do nothing, that a prudent company carrying on a dangerous business such as that of a gas company would do. It had been suggested that they should find out where the Borough Council or other local authority were mending a road. But he wished to insist that it was the duty of the local authority to tell them. Should they not write and inform the Company that they were going to break up a road, and possibly break the gas-mains? Surely, this was only fair and reasonable. The negligence, if there was any at all, was on the part of the Borough Council in not letting the Company know what they were doing. The position was this—that local authorities had powers to use steam-rollers on the highways; but, by Act of Parliament, gas companies were also empowered to lay mains under roadways. If, therefore, anyone was liable for the breaking of the mains, it must be the local authority. In conclusion, he asked the Jury to act as fair-minded men without sympathies.

Mr. *H. S. Reeson*, Assistant to the Company's Distributing Engineer, said that so soon as he received notice of the escape he went to the spot. The work of opening the street was started at once, and it was not until eleven o'clock that the fractured pipe was found. He was positive that there was no hollow under the pipe; it was resting solidly on the earth.

Mr. SCARLETT: How many of these cases do you get in a year?

Witness: About 20 broken pipes, I should think.

Then do you not think it advisable to ask Borough Councils where they are going to repair roads?—No; the idea is impracticable. A steam-roller may start from a yard, but we do not know where; and do you suggest that we have to leave inspectors all along the route to see if anything has happened?

Are you thinking of approaching the Council now that this has happened?—No; I do not think so. I do not see that it would do any good.

Then I suppose you are going on killing people and choking them without lifting a finger to prevent it, though you know now, from past experience, the danger of the thing going on. You are going to do nothing?—I suggest that it is the duty of the Borough Council to let us know what they are going to do.

But why not write to them?—Because, as I say, it is the duty of the Council to write to us if they are likely to upset our mains.

If I may take your evidence as interpreting the actions of the Gas Company, it seems that the public are to suffer while the Company and the Borough Council are making up their minds who will write to the other. Should not the mains be inspected at given periods?—We have 62 square miles of area, and 2000 miles of iron piping; so that you will see the idea is quite out of the question.

But I do not mean a yearly, three-yearly, or even seven-yearly; but this is forty years?—If the roads were pulled up and the mains tested, the earth would be loosened to such an extent that the very object for which the inspection was made would be defeated. Good stiff, solid-made earth would be loosened and rendered useless for the purpose.

Dr. *George Hastings*, the Consulting Physician to the Company, attributed the suggested lasting effects of gas poisoning to imagination. He said there was no more in gas poisoning than in taking a little gas to have a tooth extracted. The effect went off in a few days.

Several of the Company's staff having given evidence to the effect that the main in question was well laid, and that the damage could only have been caused by the steam-roller,

Mr. *G. F. L. Foulger*, the Company's Distributing Engineer, was called. He said it was unreasonable to ask for periodical inspections of mains, as not only would the work be stupendous, but more harm than good would be done. He admitted that at the inquest on Mrs. Choate he said that the break might have been caused by a subsidence of the earth under the pipe; but this was only an impression he had formed at the moment, and not an opinion given upon what he knew. He had since had time to form theories. He now thought that the motion of the steam-roller was such that, as it came onward, it pushed a wave of earth in front of it; and this happening repeatedly, the tension became too much, and caused the pipe to break. By constant observation, he had seen that there was a tendency for London "made road" soil to silt—due to many causes.

Mr. SCARLETT: Then does not that bear out my contention that there is a necessity for periodical inspection?

Witness: I do not think so. It would make matters more dangerous.

You cannot even see the necessity, though there has been a fatal poisoning?—No. As I say, it would increase the danger by constantly disturbing the foundations on which the pipes rest, and is a wholly impracticable suggestion on your part.

This closed the evidence for the defendants.

Mr. NEILSON then again addressed the Jury, and emphasized his contention that the Borough Council were liable, as they had not informed the Company of what they were doing.

Mr. SCARLETT submitted that he had clearly made out negligence on the part of the Company in not looking after their mains, and in not using often enough their appliances for testing for escapes of gas.

Before his Honour addressed the Jury,

Mr. NEILSON asked if they might be directed to say whether the Company had been negligent, and, if so, in what way?

His HONOUR, however, declined to do this. He then addressed the Jury generally on the evidence, and asked them to say if the plaintiffs had proved their case, as the question of the liability of the Borough Council did not concern them at all. That was a matter which, no doubt, would be gone into on some future occasion.

The Jury then retired, and were absent for more than half-an-hour. On returning into Court, they gave a verdict for the plaintiffs—awarding Mr. Lawrence £25, Mrs. Lawrence £10, and the child £5. They added, as a recommendation, that gas companies and borough councils should arrange to be advised by each other when street repairs were being carried out; and, further, that, in their opinion, gas escape indicators should be periodically used.

Judgment was then entered for the plaintiffs for £40 damages, and costs.

COUNTY OF LONDON QUARTER SESSIONS.

SESSIONS HOUSE, CLERKENWELL—Friday, Dec. 14, 1906.

(*Before Mr.* R. LOVELAND LOVELAND, K.C., *Chairman, and a Bench of Justices.*)

Metropolitan Water Board v. Assessment Committee of the City of London Union.

As was briefly announced in last week's "JOURNAL" (p. 433), an appeal by the Metropolitan Water Board against assessments by the Assessment Committee of the City of London Union, at the quinquennial valuation of 1905, has been before the County of London Quarter Sessions since the close of last year. After the evidence had reached a certain stage, the case was adjourned; and it again came before the Court on the 30th and 31st ult. and the 1st inst., when it was once more adjourned till the 25th inst. The appeal is in respect of 101 out of the 114 parishes in the City of London Union; and we commence to-day a summarized report of the arguments and evidence that have been submitted to the Court.

Mr. DANCKWERTS, K.C., Mr. HORACE AVORY, K.C., and Mr. BOYDELL HOUGHTON (instructed by Mr. Walter Moon) appeared for the Water Board. The Counsel for the City of London Union were Mr. BALFOUR BROWNE, K.C., Sir EDWARD BOYLE, Bart., K.C., M.P., and Mr. WALTER C. RYDE (instructed by Messrs. James White and Leonard). Mr. BALFOUR BROWNE and Mr. WALTER RYDE appeared on behalf of the Greenwich Union; Mr. W. C. RYDE, Mr. COX SINCLAIR, and Mr. BICKMORE, for the Woolwich Union; Mr. CUNNINGHAM GLEN, for the Holborn Union; and Mr. SANDERS and Mr. E. COCKLE, for the Borough of Islington.

Mr. DANCKWERTS, in opening the case, said this was an appeal by the Metropolitan Water Board in respect of their assessments in 101 out of the 114 parishes in the City of London Union. The 1900 assessment was £68,513 gross, and £45,881 net; and this had now been raised to £82,441 gross, and £55,108 net. The Board asked that the amount should be reduced to £40,303 gross, and £32,277 net. The state of things which was in existence on April 5, 1906, when the quinquennial list came into force, was totally different in regard to the water supply of London from what was in force upon any previous quinquennial. In fact, a new departure had been made altogether, which necessitated a reconsideration of the whole matter. The problem to be solved, of course, was, what was the rent which a hypothetical tenant would give for the concern from year to year for the next five years? The whole of the appeals dealt solely with the question of mains laid in and under streets. As practically the compulsory supply of water was had by every ratepayer, it might be taken that the ratepayers and consumers were identical; and therefore, as regarded the compulsory supply, he would ask the Court to look on it as the ratepayers, through the Board, supplying themselves with water. As to the transfer of the Companies, he was going to prove beyond dispute that the enterprises which had been handed over to the Board now constituted one undertaking, and legally had to be so conducted—it was not a mere paper amalgamation. This was the first point of difference between the parties. The contention of the City of London Union was that the undertaking of the Board should not be regarded as a whole, but that they should be at liberty to "hark-back" to what was once the case (though it never would be again), and take the acccunts of some water company in respect of which was once its area, and assess that as a separate enterprise. There were a series of instances in which it had been determined that, when they had an undertaking which extended through several parishes, they were not to take what was in any particular parish and assess that by itself apart from the rest, but were to regard it as what in fact it was—a part of the whole—and assess it accordingly. The way in which it was done was this: They first found out what a hypothetical tenant would give by way of rent for the whole concern, and having arrived at this deducted

from it what he would call the unproductive works and the unproductive mains which were to be assessed in the parishes in which they were situated. The residue gave the value of the productive mains; and this had to be divided among the various parishes in which those productive mains were. Adding these two assessments together, the total assessment for each parish was arrived at. The usual method was to divide the annual value of the whole of the directly productive mains according to the receipts in the various parishes. Whether or not it was the right way in this case, he did not know. It would depend a good deal upon what the Court decided on the point of principle; and anyway it was a matter that concerned the parishes more than it did the Board.

The CHAIRMAN: Supposing we were to consider eventually it was one undertaking, we should not be asked, I take it, to split up all these various parishes ourselves?

Mr. DANCKWERTS replied that he thought, once they had the total figure settled, there would be no difficulty. It did not matter much whether a ratepayer paid a higher water-rate or a higher other rate; he got it one way or the other. But it might make a vast deal of difference as between various classes of ratepayers and consumers, particularly in cases where owners paid rates, and there were complications of that sort. He then quoted at length sections of the Act of 1902 by which the Board was established, to show that the intention of the Legislature was that the whole thing should be one concern. In fact, he said, the Board had succeeded in amalgamating the whole undertaking. Various districts were supplied by different works from those which previously supplied them; and there was a system arranged so that in any one of the parishes concerned water could be distributed from any one of the sources of the Board. There was a clerk's department, an engineer's department, and an accountant's department which practically managed the whole concern; and there was one Engineer-in-Chief—Mr. W. B. Bryan. The whole of the water area, instead of being divided into ten districts as previously, was now divided into five, merely for convenience; and the present divisions had no relation to the old areas. The concern was one and indivisible, and must be so assessed. The next question was, upon what principle was the rateable value of the whole concern to be arrived at? This, he thought, would be the knottiest point to be solved. There was a certain amount of confusion in the authorities; and this he was afraid would necessitate the Court, whichever way the decision went, stating a case. He, at all events, regarded himself as being there for the real purpose of enabling the Court to solve this question—as representing the ratepayers in both positions, if he might say so. In connection with water-works which were private enterprises, the way to arrive at the rateable value was by what might be called the "profit system." Here the hypothetical tenant was supposed to become the tenant of the water-works in the hope of being able to make a profit over and above the rent which he had to pay; and the whole process the Court had to go through was to satisfy themselves how much the tenant could pay by way of rent, leaving himself a fair profit. This might be—but he did not think it was—the right way of arriving at the assessable value in the present case. There were other ways. For instance, it had been suggested that the interest which was paid for the debt might be regarded as the rent which the hypothetical tenant was paying for the concern. But, whether it was right or wrong, there was no actual decision of the Courts which said this was the principle which must be adopted. Then there was a third way, which he was going to suggest was the right method in this case. Whatever decision was come to, it might be that the Courts would afterwards decide that it was wrong; and then they would have to come back to this Court again. There was now power under the Act of 1904 to send back a case with directions. Prior to the year 1886, the doctrine of regarding what he might call the "sitting owner" or the "sitting tenant" as one of the possible tenants did not prevail. In that year, for the first time, it was established that this was one of the ways in which they might arrive at the hypothetical tenant's rent. The case was *Queen v. School Board for London*. The decision was that "in assessing to the poor-rate schools occupied by a School Board, which can make no profit in a commercial sense as tenant of the schools, the School Board itself ought to be considered as a possible tenant, and the gross and rateable values calculated by the rent which the Board might reasonably be expected to pay for the premises for use as schools." This decision created what he might almost call a new era in rating law, because it had never occurred to anybody to apply that test before; and the possibility of regarding as one of the hypothetical tenants the owner or the occupier enabled a number of cases to be solved which were insoluble before. All sorts of public enterprises could be assessed on the footing of the rent which the public authority who owned and carried on the concern would be likely to pay for it. This really received its final consecration by the House of Lords in a case connected with the London sewers. In that instance, the House of Lords came to the conclusion that the public authority who owned the sewers and the sewage works might be taken into account as one of the hypothetical tenants, and the rateable value be fixed accordingly. These public authorities had a duty to supply a sewer; and it was held that, if they did not own the sewers, they would be willing to become tenants of them at a figure arrived at in almost every case on a percentage of capital value. The House of Lords further held that it was immaterial to consider whether the hypothetical tenant—the County Council in that case—had or had not power to rent the sewers. It was assumed that they had the power, and would become tenants. Sewers had been so rated ever since; and what was most astounding of all was that the Court of Appeal had now affirmed that a sewer assessed upon this principle could be assessed to income-tax under Schedule A. Thus the little decision of 1886 had had far-reaching consequences. Here he was going to ask the Court to hold that the only possible tenant of this water undertaking—for cogent reasons which he was going to give at another stage—was the Water Board. Then he was going to ask the Court to assess the rateable value upon this basis, and assess it upon the capital value of the concern, and a percentage thereon—that was to say, to arrive at the rateable value by taking the capital value and putting a percentage thereon, and then dividing it up in the usual way, or such other way as might commend itself as fair to the Court.

At this point, Mr. Danckwerts asked that, as Mr. Bryan had to go abroad the following day, he might call him to give his evidence at once—instead of waiting until he (Mr. Danckwerts) had finished his speech. No objection being raised to this course,

Mr. *W. B. Bryan*, the Chief Engineer of the Metropolitan Water Board, was called and examined by Mr. HORACE AVORY. Witness said that since the "appointed day" (June 24, 1904) the whole system of supply over "Water London" had been conducted as one system, irrespective of the former arrangements under the old Companies. There was now intercommunication of mains and works between all the districts, so that any district could be supplied if necessary from another. In fact, this was being done every day. The boundaries of the old districts had been altered for the purpose of more efficient administration. The Staines reservoirs, which formerly belonged to three Companies—the Grand Junction, West Middlesex, and New River—were now available for the whole of the system. So far as his department was concerned, all the contracts for the supply of materials or for work done emanated from the head office for the whole system. There was no distinction made for the different districts of the old Companies in the supply of material.

Mr. BALFOUR BROWNE (to witness): I have a good many questions to ask; but doubtless you will tell me if someone else can answer them, and then I will not put them to you. I want to know whence the domestic supply for the City is derived—the various works. I also want to know what works you have that are totally unconnected with the City supply. I want, also, to know the amount of water, filtered and unfiltered, supplied to the City; and I want to get the cost of filtration, pumping, and management, and the proportions of water derived from various sources. If you cannot tell me, I can put these questions to someone else.

Mr. DANCKWERTS: I can tell you that some of them you cannot get answers to at all, because they do not exist.

Mr. BALFOUR BROWNE then proceeded to cross-examine witness, who said that intercommunication between various districts existed before the creation of the Water Board; but it had been added to very largely indeed since the Board took it in hand. The area was now, for administrative purposes, divided into five districts. The City of London was supplied from reservoirs at Claremont Square and Crouch Hill; and it could also be supplied from one or two smaller reservoirs. The pumping-stations could serve any of the reservoirs in case of necessity. There was a minute quantity—a non-domestic supply of unfiltered water for street purposes—derived from ponds at Highgate and Hampstead, and stored in an open reservoir in Camden Park Road, to which the water flowed by gravitation. It was not a fact that the Hornsey Lane station pumped water to the Southgate district only, as it also served the Crouch Hill reservoir. All the water that was pumped from the wells into the New River mingled with the New River, and could not possibly be ear-marked at any particular station. It went through the filter-beds, and formed part of the supply to the City. He could not tell the amount of filtered water supplied per diem to the City. It was a difficult thing to get at, because the mains supplying the City also ran through other districts, and there were no special meters to ascertain the exact supply to any particular part. The amount supplied to the former New River district varied every day throughout the year; but it might be taken as approximately 40 million gallons daily. Speaking from memory, he should say that the amount of unfiltered water supplied daily would be considerably under 500,000 gallons. Taking the average throughout the whole of London, the cost of filtration worked out at about one-thirteenth of a penny per 1000 gallons. The New River figures were not kept separate now; but in the past the cost varied from one-tenth to one-thirteenth of a penny per 1000 gallons. This, of course, was only the working cost, exclusive of the capital cost of the construction of the filters.

Mr. BALFOUR BROWNE: Can you tell me what price was paid by the New River Company to the Lea Conservancy for the 22½ million gallons which they had a right to take?

Witness: I think the total amount is set forth in the Lea Conservancy Act of 1900. It was altered; and I believe it is £8000 a year divided between the East London and the New River districts now.

Re-examined by Mr. HORACE AVORY: Before the Act of 1902, in the cases where there was intercommunication the Companies had to pay for any water which they took from another Company. Now, in the case of intercommunication between one of the districts and another no payment is credited or debited at all in the accounts.

The CHAIRMAN: There is no paper debiting or crediting?

Witness: No. We simply keep the statistics, for our own purposes, of the amount of water transferred.

I may take it from you generally that the areas now are perfectly different from the areas of the several Companies?—They are.

And that the accounts of the various Companies would be different now, because you have a different system altogether?—Yes.

Saturday, Dec. 15.

Mr. DANCKWERTS this morning resumed his address (which had been interrupted on the previous day for the taking of Mr. Bryan's evidence) by quoting the cases of *Corporation of Worcester v. Droitwich Assessment Committee* and *Corporation of Liverpool v. Overseers of Wavertree*, which he said established his proposition that, when there was a thing which was the creation of Statute, and could not exist apart from Statute, it must be taken such as the Statute made it, and it must be regarded as that which the Statute created, and nothing else. Under the Act of 1902, the receipts of the Board were absolutely disposed of. No tenant who took these works would be able to put any of the profits in his pocket; and this necessarily excluded the principle of rating of profits, whereas it was of the essence of the thing that the tenant should have some inducement in the shape of a profit which he might put in his own pocket to pay rent, and incur the risks of running the enterprise and having to find the rent. If by law the tenant could not put any part of the profit in his pocket, he thought it required very little common sense to hold that one could not in practice find a tenant for such an enterprise at all. But there was a duty created in the Board to run this enterprise, which they would be bound to fulfil; and it must therefore be taken that they would be willing to pay a rent of some sort for the water-works. Thus the Court were not driven to

hold that the concern was not rateable at all. Though nobody else would be willing to become a tenant, still, as in the case of the sewer he had referred to, the Board, who were bound to have the works, would be willing to become a tenant, and pay rent for them. He then quoted at length from the Act of 1902 in support of his contention that, from the financial position in which the Act placed the undertaking, the only possible tenant was the Water Board. He pointed out that the Board had receipts, which must all be carried to a common pocket, no matter whence they arose; and out of this common pocket everything had to be paid. Necessarily, the expenses of carrying on the concern must come out of it. Then, further, the interest on the moneys borrowed had to be paid out of it; and whatever surplus there was had during the next twenty years to be accumulated, and then applied to the redemption of the stock. The Board could not do what they liked with any profits which they might make by carrying on the concern. They must be utilized for a particular purpose, and for no other object; and any tenant taking the works must of necessity be subject to the same restrictions. There was no point where a tenant could "get a bit for himself," as the phrase went, in carrying on the concern—certainly nothing at all which would in any way enable him to meet, out of anything he could get from the undertaking, the enormous risks which he must incur in carrying it on, and the risk of finding the rent which he would have to pay. They could not have an enterprise the profits of which were more absolutely tied hand and foot than was the case here. He submitted therefore that they had to find a tenant who would be under the same restrictions; and to do this they were driven to the Water Board. The case of *Mersey Docks and Harbour Board v. Overseers of the Poor of the Parish of Liverpool*, so far as it was material to the present one, absolutely confirmed his arguments. They had to assume a tenant who could not deal with the rates in any other manner than the Water Board could; and he thought he was not using too strong language when he said that nobody but a born fool would become tenant of these works on those terms. In the Erith sewer case, to which he had already referred, it was determined, in 1893, after three years' litigation, that the "sitting owner" might be taken into account as the hypothetical tenant. It was held that the true test of beneficial occupation was not whether a profit could be made, but whether the occupation was of value—that even supposing the London County Council could not under the Statutes legally be tenants, they ought to be taken into account as possible hypothetical tenants, for the purpose of determining the rateable value of the premises which they owned and occupied. Those were the two principles which now governed all these cases, and which the Court were bound to follow if they thought them applicable. They had to act on the hypothesis that the Board was not the owner, but would be willing to become the tenant of these water-works. Then they had to ask themselves at what rent they would be willing to become tenants; and they had to understand that there was a limit when the camel's back would break, and that limit was when the supposed tenant would rather go and make works for himself than hire the existing ones at an extravagant rental. As a rule it was assumed that county councils and bodies like them who were supposed to be hypothetical tenants would not be willing to give more than the interest they would have to pay on the capital needed to reconstruct the works or to construct similar ones. After citing various other authorities, he said that what he suggested as the true principle was the one of treating the undertaking as one concern, the only possible tenant as the Metropolitan Water Board, and that they would pay a rent based upon some rate of interest on effective capital value. His side had the concern valued before they appealed at all; and they offered to put before the other side the valuation which had been made, with a view to quickly ending the matter.

Mr. BALFOUR BROWNE: My learned friend will remember the offer to lay the valuation before us was only if we accepted his principle.

Mr. DANCKWERTS denied this; and, continuing, remarked that the valuation worked out in round figures to £18,000,000. The rate of interest at which the Board could borrow, to cover all expenses, was something under 3½ per cent.; so that if the Court took this figure, it would be very fair. But if his Lordship was with him on this principle, a few millions more or less on the capital, and 1 per cent. more or less on the percentage, would make no difference. If his Lordship adopted the principle substantially, he need not worry himself about the figures at all, because the valuation fell far below what his side had asked the Court to reduce it to. Upon the principle that he asked the Court to adopt, the Board were bound to succeed.

The CHAIRMAN: Can you give me what 3½ per cent. on £18,000,000 would be?

Mr. DANCKWERTS replied £630,000. This was for the whole concern. He believed even if they doubled this, they would still be within the mark. If the Court took the other alternative which suggested itself to him—namely, treated the interest which was paid to the stockholders as being the rent paid by the Board for the concern, then they were still entitled to succeed on the appeal. He thought, also, if they were right upon taxing it as one concern, and upon the old principle of arriving at what a tenant could afford to pay, they would still succeed. But the last method would involve a long investigation by the Court, while the other two would be comparatively short.

The CHAIRMAN: When one comes really to look at the figures for an enormous undertaking like this, there is not so very much difference, because you ask for, roughly, £40,000 gross and £32,000 rateable. I do not say anything about the Assessment Committee, but the Overseers give £61,000 and £45,000; so that, taking the rateable value, one is £45,000, and the other £32,000. For an enormous undertaking like this, that does not seem to me to be very much difference.

Sir EDWARD BOYLE: The Overseers only put that in as a matter of form—leaving it for the Assessment Committee to deal with. It is exactly the old valuation to a pound.

Mr. DANCKWERTS, continuing, said the passage which suggested the possibility of taking interest as a basis would be found in the *Mersey Docks v. Cameron* case; but he was bound to say he did not know of any other case where a similar suggestion was made. Having arrived at the rateable value of the whole, the next question that arose for the Court was how the whole was to be distributed over the parts. They knew the time-honoured method in connection with the profit-bearing or profit-earning tenancy—or the profit-taking tenant. What was done was to arrive at the rateable value of the whole, and then deduct from it the rateable value of the indirectly productive works, because they had to be locally assessed in the parish where they happened to be situated. Then the balance gave something which represented the direct profit-earning part of the concern; and this was distributed in accordance with the receipts of the various parishes. This, of course, if the third method was held to be the right one, would be the result here. Now in regard to the first and second methods, there were distinctions. Both would give the rateable value of the concern; and he thought it followed that they would have to deduct from this, because of the necessity for local assessment in each of these two cases, the rateable value of the indirectly productive works. This would give a balance representative of the rateable value of the directly productive works of the whole concern. And now the question arose, upon what principle were they to distribute this among the parishes? Two things suggested themselves to him. The first was to distribute in accordance with the customary plan, on the basis of receipts in the various parishes. This commended itself to him for two reasons. First, because it was the time-honoured method which had the sanction of the Courts; and, secondly, because there seemed a "smack" (if he might use the expression) of fairness about it. It gave the greater value to the parish where the greater receipts were. The other method was one which could not be applied to the "interest-rental" plan (taking the interest paid to the stockholders as the rent). It was to distribute everything on the principle of capital value in the parishes. This seemed more logical; but he doubted whether it was as fair as the other. At present, unless the Court ruled that he must go on, he preferred not to go into the third method which he had pointed out—the old "profit system."

Mr. BALFOUR BROWNE said his learned friend had to prove his case. It would not do for him merely to throw three alternatives at the head of the Court. He must give the grounds of his contention that the Board had been over-assessed. When he was before the Assessment Committee, he went on the profit basis; but it was quite true they said then, as they said now, that the concern was to be taken as a whole. If his learned friend elected to go on the profit principle, he must prove what the profits were, and give the respondents an opportunity of cross-examining his witnesses. As to the £18,000,000 suggested in connection with the first method, the amount awarded for the Companies—though he admitted that this was not conclusive—was over £30,000,000. With regard to taking the interest paid to the stockholders as the rent, this apparently rested only on one authority—the Mersey Dock case. This would be perfectly sensible; but still, even then, they wanted to know how the Board valued, not the whole undertaking, but the part in the 101 parishes in the City of London Union. He had nothing to do with the rateable value of the other parts of the undertaking.

Mr. DANCKWERTS replied that the method he was prepared to stand upon, and insist upon, was the method of capital value and interest thereon. He thought he made it perfectly clear that this was the one which the appellants placed in the first rank. He said that if the Court ruled against them on this, then they suggested the interest paid to the stockholders as the alternative. If the Court were against them on that, then they were perfectly willing to prove that even upon the third, or profit, system they were right. Whichever of the three footings was taken, they would win the appeal. At the same time, he preferred to win it on what he considered good legal, logical grounds; and therefore he placed the three methods in that order. The method of arriving at the assessment of the several parishes of the City of London was by first arriving at the whole and then allocating it.

Mr. BALFOUR BROWNE: My learned friend has now said he will take capital value and interest thereon. I want him to prove capital value.

Mr. HORACE AVORY: We will proceed now with evidence similar to that of Mr. Bryan—I mean towards the same end, to prove that the whole thing is worked as one entire concern.

Mr. *J. W. Restler*, the Deputy Chief Engineer of the Metropolitan Water Board, examined by Mr. HORACE AVORY, confirmed generally the statements made by Mr. Bryan with regard to the undertaking of the Board being worked as one concern. By means of a map he explained the present division of the districts for administration purposes; and he then gave illustrations of the intercommunication, to show that there was no distinction made between the districts. The Staines and Walton reservoirs could be used for any part of the district. Having regard to the present system, it was impossible to allocate any particular supply to the City; it was supplied from a number of sources.

Mr. BALFOUR BROWNE cross-examined witness at some length as to the sources from which the New River received its supply, and the variation that had been made in the district. Witness pointed out that the New River district had been modified to the extent of the absorption of Tottenham and Enfield.

Mr. *F. E. Harris*, the Comptroller of the Board, examined by Mr. HOUGHTON, said that soon after his appointment in 1904, he made an exhaustive examination into the methods by which the various Companies had previously kept their accounts. He found considerable differences, not only in details, but in the principles upon which the accounts were kept—differences which made it impossible to form a comparison between the results of the Companies in certain respects. Under the provisions of the Act constituting the Water Board, they had kept the accounts as those of one undertaking. The collection of revenues was all controlled from the head office; and all payments were made from there. The clerical administration was from the head office; and the Chief Engineer was located there. A Bill was to be introduced for making uniform the charge for water in all districts.*

Mr. DANCKWERTS: That would rather show that the rate upon the past receipts would be inaccurate as regards the future for the next five years. Any assessment based upon past receipts might not agree with the receipts for the future charge.

The CHAIRMAN: I am told it comes to much about the same thing. It used to be 4 per cent. with extras; and the Bill asks for 5 per cent. without extras.

Witness: It will vary in each of the areas considerably.

* This has since become law.—ED. J.G.L.

The CHAIRMAN: That is a very small matter.

Examination continued: It was only because the central office was insufficient in accommodation that they did not transfer the whole of the portion of the work for which he was responsible. It was practically impossible, from their system of keeping the accounts, to show the result of the working in any particular district. The Staines reservoirs had now become an intregal part of the whole undertaking. He reckoned that the Board could borrow money in the open market at well under 3½ per cent.

Cross-examined by Sir EDWARD BOYLE: The alterations that had been made in the staff were with a view of ultimately creating a saving. He was not aware that the respondents had not been allowed to look at the accounts. Personally, he offered their Accountants, Messrs. Wood, Drew, and Co., every opportunity for examining anything they wished to. He did not know whether the only books they saw referred to the New River.

Mr. DANCKWERTS: I protest against this suggestion. The case has always been, "We do not want to have anything to do with anything except the New River;" and, in pursuance to this, they blinded their eyes except to the New River.

Sir EDWARD BOYLE: Our contention is that we are only dealing with the New River; and you will see why.

Cross-examination continued: The receipts had been increasing; but he should not like to say by "leaps and bounds."

Claim against the Gaslight and Coke Company.

At the Westminster County Court last Tuesday, before his Honour Judge Woodfall, Mr. Harry Want brought an action against the Gaslight and Coke Company to recover damages for injuries sustained by him through their alleged negligence. Mr. Doughty appeared for the plaintiff; Mr. Neilson (instructed by Messrs. Monier-Williams and Robinson) represented the defendants. The plaintiff stated that on Sunday, the 17th of March, he and his wife and daughter were going down Evering Road, Stoke Newington, when he tripped up over a mound of earth left by the workmen of the Company opposite No. 25, where they had been doing some repairs to a main. He thought the mound was quite 6 inches higher than the other ground, and the spot was very dark. The result of his fall was that he broke a rib and also his glass eye. He was first taken home and afterwards to the German Hospital, where he remained for more than eight weeks. In cross-examination, witness admitted that he had been several times convicted for drunkenness; but he declared he was now an abstainer. His wife and daughter having given corroborative evidence, Dr. Stocker, the House Surgeon of the German Hospital, confirmed the statement as to the plaintiff being an in-patient there. For the defence, two employees of the Company deposed that the ground was left in a perfectly safe condition, that there was an electric light within 60 feet of the so-called "mound," which was not more than 1½ inches high. Other witnesses testified to the ground being safe, and said there was no need for anyone to go over the mound. Mr. Neilson having submitted that no negligence on the part of defendants had been proved, his Honour, without calling upon Mr. Doughty, said he thought the plaintiff was entitled to recover, but not the amount of his claim. He therefore awarded him 25 guineas and costs.

A Question of Gas-Engine Vibration.

At the Portsmouth County Court, a short time since, the hearing was commenced before his Honour Judge Gye, of an action for damages and an injunction restraining the Portsmouth Hippodrome, Limited, from using a gas-engine to generate electricity, on the ground that it was a nuisance to the plaintiff, Mr. W. Chandler, an auctioneer. In opening the case, Mr. Cababé explained that the plaintiff was the freeholder of premises situated at Nos. 12 & 14, Russell Street, where he had carried on business for twelve to fourteen years. The defendants were the owners of a large place of entertainment; and, as was necessary, it was brilliantly lighted by electricity. The Hippodrome premises extended to the rear 55 yards down Salem Street, and in almost immediate proximity to Mr. Chandler's premises. At the back of the hall a gas-engine had been erected of considerable horse power for the purpose of lighting up and making electricity for the whole building. It was apparently more profitable for the Company to make their own electricity than to purchase current; but arrangements had been made for the Corporation current to provide a supply when the gas-engine was not running. The Company had engaged not to run the engine when service was going on at the Baptist Chapel next door. The engine began to work on June 18; and the vibration was very great indeed, and had continued so. The whole place shook whenever it was going. There were two performances every evening; and on two days a week matinées were held. The noise and vibration were simply intolerable. The pictures shook on the wall, the doors and windows rattled. The vibration beats were about ninety per minute; and the noise was such that the occupants could not hear themselves speak. The upstairs part of the house was occupied by the plaintiff's assistant, his wife, and two children; and the children could not sleep for the noise. The engine rendered the premises practically unfit for the purposes for which they were used. Counsel put in a large amount of correspondence between Mr. F. G. Allen, on behalf of the plaintiff, and the Company, in which repeated complaints were made. Evidence for the plaintiff having been heard, the case was adjourned, in order that the Judge might have an opportunity of testing the engine at work. The hearing was resumed last Thursday, when his Honour gave judgment for the plaintiff for £80.

The bursting of a 30-inch water-main last Tuesday caused some inconvenience in the neighbourhood of Whetley Lane, Bradford. The water tore a large hole in the roadway, and flooded various premises. The main was one of the service-mains from Heaton reservoir, supplying the low-level district of Bradford and portions of Cleckheaton and Low Moor. No inconvenience to water-users was caused by the breakage; and the damage was repaired in the course of the day.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Two New Departures.

The Half-Yearly Meeting of the Proprietors was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting; and then the Directors' report and the scheme for the division of profits, as follows:—

The Directors have pleasure in reporting that the workings of the Association's stations during the half year ended the 30th of June last have proved satisfactory.

The profit of the half year, together with the sum of £16,040 brought forward from the account of the preceding half year, amounted to £253,435, as compared with £238,640 on the corresponding date of 1906.

The quantity of gas sold in the half year under review shows an increase at the rate of 9 per cent.; but the profit earned has not increased in a corresponding ratio. The average price of the coal carbonized in the half year was 18s. 7·56d. per ton, or 7·32d. per ton more than in the corresponding period of 1906. The value derived from the sale of coke showed some improvement, but the revenue from tar and from ammonia products was less than in the corresponding half year.

The number of meters placed by June 30 last was 357,991 ordinary meters, and 105,563 prepayment meters; making a total of 463,554 meters placed, and exhibiting an increase of 24,061 ordinary and 15,341 prepayment meters. On June 30 the total number of consumers on the books of the Association was 384,735, as against 352,685 on June 30, 1906—being an increase of 32,050, or 9·08 per cent. The total length of mains laid to June 30 last was 2293 miles 267 yards—an increase in length of 55 miles 232 yards, as compared with the figures of June 30, 1906.

The plant and mains at all the Association's stations were maintained in an efficient condition; such maintenance, however, entailed a considerably larger outlay in the half year under review than in the corresponding half year of 1906.

At Antwerp, progress was made during the half year with the gasholder tanks, wharfing, pier, and jetties at Hoboken; and a considerable quantity of material for the construction of the two gasholders mentioned in the last report was delivered. The construction of hot-coke conveyors at the Berchem works was proceeded with, and contracts were let for coke-handling plant on the yard, and for a new station meter, standard washer, and tar-extractor. The extension of the system of mains to the suburbs of Bouchout, Edeghem, and Hove was completed; and a beginning was made with mainlaying for the supply of the suburban commune of Contich.

At Berlin, progress was made in the erection of eight furnaces of vertical retorts at Mariendorf; seven having 12 retorts, each producing 14,700 cubic feet per day, the eighth furnace being an experimental one of five retorts of nearly treble the capacity—viz., 42,000 cubic feet per retort per day. The extension of the water-gas plant and coke-handling machinery on that works was also proceeded with. The growth of the consumption in the northern suburbs supplied from the Weissensee works has necessitated an extension of the producing power there, and two generator furnaces, each of eight retorts, have been erected. With a view to the probable further extension of this works, some additional land was acquired on reasonable terms. A plot of ground with a building on it was also purchased in the Nieder-Schönhausen district for the purposes of a district office. The building will also contain a governor for the high-pressure service.

A monopoly for the supply of gas to the Commune of Gross Ziethen—a surburb to the south-east of Berlin—was secured until 1957. The existing contracts with the Communes of Mariendorf and Schmargendorf were prolonged each for twenty years—*i.e.*, until 1966.

At the Brussels Station, the increasing consumption necessitated a further increase in the producing plant; and progress was made with the erection on the Forest works of a second bench of inclined retorts, with the corresponding coal and coke handling plant. The producing power of the Koekelberg works had also to be extended, and a contract was let for the erection there of a carburetted water-gas plant of a capacity of a million cubic feet per day. The erection on these works of an additional set of purifiers, and also of a new sulphate plant and boiler-house, was proceeded with. As the offices in the Chaussée d'Ixelles became cramped for room, it was decided to extend the building. Advantage was also taken of an opportunity to acquire the premises No. 46, Rue de l'Arbre Bénit, the street in which the back entrance to the offices is situated, for the purpose of extending the workshops and stores.

A prolongation for 24 years (until 1948) was obtained for the Association's monopoly of the supply of gas in the commune of Woluwe St. Pierre—a suburb to the east of Brussels.

The Directors regret to report that the building containing the plant of the Association's electricity generating station at Woluwe was destroyed by fire on Feb. 13 last. There was, however, no interruption of the supply, as the district supplied by this station was immediately connected with the works of the Ixelles Electric Lighting Company, by whom the customers of the Woluwe station have been, and will continue to be, supplied until the latter is once more in a position to generate its own current.

At Flushing, where the consumption continues steadily to increase, advantage was taken, with a view to future extensions, of opportunities to acquire, on reasonable terms, certain house property adjoining the works.

At Frankfort, the seven new inclined retort-settings, together with the coal and coke handling plant, on the Bockenheim works, mentioned in the previous report, were completed, and put in action.

At Hanover, the increasing consumption has again necessitated extensions; and the preliminary work for the further enlargement of the retort-house, and for the erection of additional coal and coke handling plant, and of a new coal-store, was carried out. A beginning was also made with the erection of a new cyanogen washer.

A contract was concluded with the Commune of Letter for the monopoly of the supply of gas in that district for 43 years—*i.e.*, until 1950.

At Nonancourt, one of the group of small towns in France, a twenty years' prolongation of the gas monopoly was secured, together with a perpetual right to supply gas to private consumers after the expiration of the monopoly. Contracts were also concluded on the same terms, prolonging for the same period the monopolies for the supply of gas to the communes of St. Lubin des Joncherets and St. Rémy sur Avre—suburbs of Nonancourt.

At Vienna, sundry plots of land for which the Association had no further use, were disposed of at satisfactory prices.

A contract was concluded for the sole supply of gas to the commune of

Gerasdorf, on the left bank of the Danube, for a period of 35 years—*i.e.*, until 1942.

During the half year under review, it became apparent that it would be of advantage, as affording greater convenience of working, for the Association to convert its establishments in France into a homogeneous French Company with statutes according to French law. This was done, and a Company, known as the Compagnie Continentale du Gaz, was constituted as from July 1 last. The whole of the shares of this Company are in the possession of the Association, whose Board of Directors also constitutes the Board of the Compagnie Continentale du Gaz, with the addition of M. Emile Delebecque, formerly the Association's Administrateur-Délégué.

In conclusion, the Directors desire to draw the attention of the proprietors to the Association's accounts for the half year under review, and particularly to the balance-sheet, a copy of which was appended to the circular to the proprietors calling this meeting.

These accounts have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme, showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 4 per cent. for the half year ended June 30 last, payable, free of income-tax, on and after Tuesday, the 12th inst.

Scheme for the Division of the Profits of the Half Year ended June 30, 1907.

Dr.—Balance brought forward from last half year . .	£16,040	3	6
Profit resulting from the workings at the stations, and dividends on investments, less interest on debenture stock and the charges on account of depreciation and income-tax.	237,394	18	3
	£253,435	1	9
Cr.—Dividend of 4 per cent. for the half year	£197,600	0	0
Credit to pension reserve	30,000	0	0
Balance carried forward to next half year . . .	25,835	1	9
	£253,435	1	9

A Change of Custom.

The Chairman moved the adoption of the report. In doing so, he said he must admit when he came to the meetings of the proprietors, and had to speak upon the affairs of the Association, he did so with mingled feelings. He had feelings of great exultation (if he might say so) on the considerable progress which the Association had made, was making, and would continue to make in the future; and he was also oppressed with the feeling, in addressing the proprietors, of not knowing where to begin, and where to end, with the affairs of such a vast undertaking as this spread before him, with its enormous responsibilities and its interests in all the countries of Europe, with such magnificent works as those that belonged to them, and with the varied ramifications of the undertaking. This was also impressed more strongly on him when he returned home after a prolonged period of inspection of their works; and when he had seen what a splendid institution the proprietors owned. On this occasion, he intended to speak at some greater length than he had been in the habit of doing, because the Directors had, during the six months under review, made certain new departures. The first departure to which he wished to make some allusion was the publication of the balance-sheet. They had had 150 meetings in the history of the Association without any balance-sheet having been placed in the hands of the proprietors; and on this the 151st meeting, the Board had issued a balance-sheet with the notice of meeting. He had no doubt the proprietors would like to know why the Directors had gone from their old conservative custom of keeping their accounts in the office, where, however, they had always been available for the inspection of the proprietors, if they so desired. The cause was this: On the Continent as in England, there were supervisors of income-tax; and they had been very insistent of late years with regard to the profits that were made at the different stations of the Association, and also with regard to the profits which were shown by the Association in London. They, like their *confrères* in this country, were not easily put off with mere statements. It had been insisted by the authorities in the different countries where the Association operated, that the accounts should be published; and therefore as these accounts were in the hands of so many people on the Continent, the Directors had thought it was only reasonable they should change their habit with the times, and hand to the proprietors a printed copy of the balance-sheet.

Explanation of Items of Finance.

It was necessary for him to allude to a few of the items in the balance-sheet. Beginning with the left-hand side, the first item of importance which needed explanation was "sundry creditors, £521,000." This, he daresay, seemed a very large sum of money to be apparently owing by the Association; but the truth was that this sum consisted not only of money due for coal and other stores, but also of numerous credit accounts kept at the stations—such, for instance, as "deposits of consumers," which again appeared on the opposite side of the balance-sheet under "sundry debtors." Then he came to the pension reserve, to which the Directors proposed to transfer £30,000 on this occasion. This was an account which received the unanimous approval of the proprietors when it was started three half years ago; and it would have to be very greatly increased before it earned anything like the revenue it should do to correspond with the amount of the pensions the Association paid. He had the exact figures as to the pensions paid to the old members of the staff and to men formerly on the wages list. They amounted to a total of £37,309 annually, which sum had to come out of revenue. On the other side of the account, there was an item, "Works and mains, less amortization." The amortization, as the proprietors were aware, was the reduction of their leasehold tenures at the various places they lighted. The Directors were, of course, always endeavouring to obtain longer leases. Sometimes they were successful; on other occasions, they were not. And this amortization fund was to replace, at the end of the concessions, the capital which stood in the books of the Association as the value of the stations where they were working. What did they do with the amount? The proprietors would see it meant a very considerable sum. An item would be seen in the balance-sheet "Investments of loans abroad, £1,115,000." The practice of the Board had been to invest as far as possible their amortization fund in lighting companies which were in close connection with their existing stations, and in which they could profitably employ the money for the benefit of the proprietors. He could assure them that this had been the greatest and most effectual work of the Association, to get in touch with foreign companies who were (he might say) on the borders of the different cities and towns the Association supplied. The Directors began a great many years ago to invest in this way. They wished to know what these companies were doing; they wished at all times to work in harmony with them; and they wished sometimes to influence them for good. It had been a great benefit to the Association to participate in the management of some of these concerns, and in the capital of others.

Increases and Extensions.

He wished now to refer to a few matters in the report with reference to the working at the different stations. The report spoke a great deal about the extensions that had been made. This was a remarkable illustration of the progress of the Association; and the progress was still proceeding. In fact, when he (the Chairman) was in Berlin the other day, their Chief Engineer in that city pointed out that, though the past month had been the most brilliant October Germany had ever known, still there was an increase of no less than 10 per cent. in the sale of gas during the month. Now to provide for such increases was very anxious work. Only a year ago, he told the proprietors that in Berlin they were laying down a large amount of plant at their biggest works at Mariendorf; and when he (the Chairman) was in Berlin, the Engineer said: "We shall have at once to begin another large retort-house to supply Berlin, or else we shall be in difficulties." This only showed what immense progress was being effected in Berlin; and the same remark might be made of the other big stations he had visited.

An Electrical Fire and Insurance.

In the report, mention was made of a fire at a small electricity-station belonging to the Association. It was not an extensive matter; the loss amounting to only £2000. But this brought him to remark that the Directors had not hitherto been in the habit of insuring the general manufacturing plant and works of the Association. They had never found that it was necessary to do so; and on this occasion, they had taken the £2000 out of revenue to replace this small electric station. They were unable to find out how the fire occurred; but it must have been due to some defect in the plant. Since the accident, however, the Directors had decided that, so far as their electric-lighting plant was concerned, they should insure in the future.

Compagnie Continentale du Gaz.

Now he wished to refer to the second new departure the Association had made. This had reference to the French Company mentioned in the report. Though it was a new departure, it was one that had been frequently discussed at the Board meetings; and he believed it had been frequently suggested by the proprietors that they should, as far as possible, get rid of the idea that the Association was purely an English Company. To carry out their policy in this regard, the Association had had an office in Paris in the name of the Compagnie Continentale du Gaz, which had had its administration supervised from London, but under which were grouped all the small French works acquired by the Association a good many years ago. Now the Directors thought fit to conform to the French law, and register the French Company under the name he had given, and with a fixed capital. He might say that the Local Authorities in all these small French towns had always looked upon the Company as purely a French one; and therefore the Directors came to the conclusion that it would be much better for this and other reasons to regularize their position in the eyes of the French Government and the municipal authorities. Though they had converted this group, which included the station at Lille (which was their largest works in France), into an actual French Company, with a capital of 10 million francs, the Directors of the Association were also the Directors of the Company, with the addition of M. Delebecque. This gentleman was for some time their Engineer at Lille; and after the retirement through ill-health of M. Ellissen—to which he (the Chairman) referred some time ago—M. Delebecque was nominated the Administrateur Délégué of the Association's French business. The Directors, however, had now placed M. Delebecque on the Board of the new Company. To prevent any misunderstanding which might arise with regard to this Company, he (the Chairman) thought it right to tell the proprietors that the statutes of the new Compagnie Continentale du Gaz provided for the remuneration of the Directors; but the Board had decided to receive no fees from that Company, although it would be necessary to hold separate meetings of the Board of that Company. Still they considered that, in administering the affairs of the Compagnie Continentale, they were simply continuing to discharge their duties as Directors of the Imperial Continental Gas Association. The effect in the balance-sheet in future would be that the value of their works in France would be taken from the item "Works and mains," and would appear as an investment abroad.

Dearer Coal.

Some few remarks he thought might be expected of him with regard to the question of dear coal; and in referring to this, he must allude to the profit of the half year. It would be noticed that they had made not only their dividend and transferred a considerable amount to the pension fund, but they were carrying forward a larger balance than they had hitherto done. The reason for doing this was twofold. First of all the greater amount of profit had arisen from the fact of the higher price of coal not having come into the accounts to June 30 last, except to a very small amount. They made their contracts in the spring; and their stations being fully stocked with coal at the old price, they had not really yet felt the pinch of the dearer coal prices. They would, however, be felt in the next six months, and probably during the next two half years; and, secondly, in all probability the price of coke would be less during the same period. Therefore the Directors con-

sidered it right, in the interests of the Association, to carry forward a considerable balance to meet any deficiency that might arise.

A STRIKE AND THE RESULT.

A good deal had been heard lately about strikes of workmen. It was a subject that was very much in the air at present; and he thought it only right to allude to a strike which took place at their principal works in Antwerp last June. They had an insubordinate workman there, who would not obey the Engineer's orders, and so he was dismissed. As he was a member of the Factory Workmen's Union, they demanded his reinstatement, and the recognition of their Society. These demands the Board declined to accede to; and the result was the whole day-shift threw down their tools one morning and walked out of the works. This action might have placed the Association in an exceedingly unpleasant position, if they had not had an able Manager at Antwerp, who was always prepared for eventualities of this sort. The Association in this matter, he was glad to place on record, had the cordial support of the Municipality of Antwerp, and of the police authorities; and they were also loyally seconded by the staff. The consequence was they were able to keep their principal works at Antwerp going in the ordinary way. A curious part of the affair was that the men at the Association's other works in the city made no move whatever, and showed their appreciation of the Union's action by keeping steadily at work. After three or four days of this sort of thing, the workmen found they had made a very great mistake, and implored to be taken back. While the Directors were anxious that those men who had been led away by evil counsels should not suffer, the Directors were obliged to mark their sense of displeasure at the whole affair, and so dismissed 32 of the chief offenders. There had been no trouble whatsoever since then—not even during the time of the great Antwerp dock strike of which so much had been read in the papers.

VERTICAL RETORTS.

A good deal had been written in the gas journals about vertical gas retorts. For nine months, they had had this type of retort in use at one of the Association's subsidiary works in the neighbourhood of Berlin; and during that time, the retorts had worked without a hitch. The Directors therefore considered that these vertical retorts had now left what might be called the experimental stage; and they were now proposing to erect in the new retort-house at Mariendorf an installation of these retorts. He might add that many gas-works in Germany and throughout Europe were adopting the system.

THE DIFFICULTY AT FRANKFORT.

With regard to Frankfort, it would be remembered that at the previous meeting, he informed the proprietors that they were in the midst of a difficulty with the authorities in regard to the laying of mains in Frankfort; and that they had had a lawsuit forced upon them, which they won in the Higher Court and in the final Court of Appeal. The mains were now being laid; and jointly with the Frankfort Gas Company (who shared with the Association the supply of gas in the city), the Board were now negotiating with the authorities for the settlement of all pending disputes and difficulties by the conclusion of a new contract for public lighting. The current agreement expired in the case of both Companies in 1911. But that was only for public lighting; they had the private lighting up to 1959—that was to say, under the original concession, the two Companies in any case retained the right to supply private consumers till that year.

IN CONCLUSION.

He had said, in the opening part of his address, that, in dealing with such a great undertaking as this, he hardly knew where to begin, nor where to end; and even now, when he had finished all he had to say that day, he felt he had merely touched the fringe of the affairs of this vast and prosperous concern. On his visit to the principal stations (which only terminated the previous Monday week), he found everything in the most perfect order, and each station fully equipped for meeting the immense demand which would come upon them during the ensuing winter.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion.

Sir JOHN RUNTZ said it had been his good fortune to attend the meetings of the Association for many years; and he thought that, without a single exception, every year there had been reported increased prosperity. He had exercised his privilege as a shareholder to inspect the accounts to see what progress the Association had made; and the figures he had taken out for the last five years were very interesting. He found that in 1902 the profits amounted to £363,000; in 1903, to £409,000; in 1904, to £429,000; in 1905, to £446,000; and in 1906, to £460,000. In the five years, the divisible profits the Association had earned amounted to more than 2 millions sterling; and the excess of 1906 over 1902 was upwards of £96,000. He doubted whether any Company in this country could show such rapid progress as this. It meant a great deal of work on the part of the Directors. They had an excellent Board; and they had given a great deal of time to making the Association the success it was. The Chairman had referred to the responsibilities and vastness of the undertaking. He (Sir John) could well believe all the Chairman had said. The members of the Board were not gentlemen who met once a week and sat round a green table; but they had to take their travels abroad, and sometimes at very short notice. Yet they heard that, in connection with the new French Company, the Directors had magnanimously waived the fees to which they were entitled. He did not remember ever having heard anything about the Directors' fees at any meeting of the proprietors that he had attended. Looking at the amount of money the Association were now earning, he thought that, at no distant date, the proprietors should take into consideration the question of the Directors' fees. The Board were certainly entitled to more than they received now. Another aspect of the figures was that they were earning just over £400,000 a year, upon which 8 per cent. was paid. According to the amount carried forward in excess of the amount required to pay the dividend, they were earning enough to pay 10 per cent., or equal to the dividend they were receiving before the distribution of capital among the proprietors last year. However, there was an extra coal bill to pay, and the Directors would nurse the increased amount of the carry-over in order to have a nest-egg when the day of trouble arose.

Mr. J. H. BEDDINGTON inquired whether the new French Company was held *en commandite*.

The CHAIRMAN: It is a Company *anonyme*, and is worked by your own Board of Directors.

Sir JOHN RUNTZ inquired the amount of the Directors' fees.

The CHAIRMAN said there was £5000 allotted among them to deal with as they thought fit. Their expenses were paid when travelling for the Company. Some 25 years ago, the proprietors voted £1000 a year for travelling expenses; but they had never spent any such amount. One year the expenses did go up to about £600; but for many years it had only been from £200 to £300.

Sir JOHN RUNTZ thought that something more should be done to show the appreciation of the proprietors.

Moved by the CHAIRMAN, and seconded by the Hon. Sir CHANDOS LEIGH, a dividend was declared at the rate of 4 per cent. for the half year (free of income-tax) on the £4,800,000 stock of the Association.

Proposed by Sir JOHN RUNTZ, and seconded by Mr. MONTAGU S. PILCHER, a cordial vote of thanks was passed to the Chairman and Directors and to the Secretary and the officers abroad, including also the staffs in London and at the various stations.

The CHAIRMAN responded; and spoke in terms of great praise of the work of the Secretary, and the station officials and their staffs.

The proceedings then terminated.

SOUTHAMPTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday—Captain A. J. CORSE-SCOTT, J.P., in the chair.

The SECRETARY (Mr. E. W. H. Eady) having read the notice convening the meeting, the report of the Directors, the principal items of which were given in the "JOURNAL" last week, was taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was sure the stockholders would be pleased to learn that the past half year had again proved a prosperous one. From the report it would be seen that the profit available for distribution was £16,029. The amount required for paying the maximum dividend was £12,854; thus leaving the sum of £3175, the whole of which the Directors had carried forward—the course adopted in the case of the December half of 1906. The proprietors would be interested to hear that a system of mechanical stoking had been successfully installed in a portion of the works. During the half year there was the gratifying increase of 13 million cubic feet in the quantity of gas sold, compared with the June half of last year, which then exceeded by nearly 13 millions the sale for the June half of 1905. The Directors were pleased to state that the amount realized from the sale of the residual products for the past six months marked an increase of no less than £945 over the corresponding period of 1906. This was most encouraging when it was remembered that the June half years of 1905 and 1906 showed decreased sales of £916 and £654 respectively. The next item to which he would draw their attention was one of increased expenditure. He referred to the rates. For the June half of 1906, when the last reassessment by the Southampton Guardians was not in operation, the total rates throughout the Company's area amounted to £2147; whereas for the past half year, when the effect of the advanced assessment was felt, they were £2681—showing an increase of £534. The number of consumers by the prepayment meter system had been augmented during the six months ending June last to the extent of 800, against 500 for the December half of 1906 (thus advancing to 14,800 the total number of prepayment meters fixed); and the demand continued highly satisfactory. There had been an appreciable addition of consumers under the ordinary system; and a considerable number of gas-cookers had been let on hire. Gas-fires remained as popular as ever. In order to further advance the sale of gas in this direction, the Directors had made arrangements for letting on hire, and fixing free, gas-steam radiators, which were designed for heating buildings of large dimensions. A temporary show room had been opened by the Cannon Iron Foundries, Limited, for demonstrating the use of these appliances; and it was expected that much business would result. The Directors continued their periodical inspections of the works, and were fully convinced that, whatever the demands might be during the coming winter, no difficulty would be experienced in coping with them. In conclusion, he congratulated the stockholders on the prosperity of the Company.

The DEPUTY CHAIRMAN (Mr. J. C. Moberly) seconded the motion, and it was carried unanimously.

A resolution sanctioning the payment of the maximum dividends having been passed,

Mr. PARSONS moved a vote of thanks to the Chairman and Directors, and expressed his pleasure, as an old shareholder, in knowing that the prospects of the Company were so highly satisfactory.

The motion was seconded by Captain HARVEY, and carried by acclamation.

The CHAIRMAN briefly acknowledged the compliment.

Mr. FOLLETT DUNSFORD proposed a vote of thanks to the Secretary, the Manager (Mr. S. W. Durkin), and the staff, and remarked that the report presented to the proprietors showed how amicably the Directors and the staff were working together.

Mr. GREENSLADE seconded the motion, and it was carried.

Mr. EADY and Mr. DURKIN returned thanks on behalf of themselves and their respective staffs, and the meeting closed.

On the recommendation of the Gas Committee, the Wolstanton Urban District Council have let the following further contracts for the gas-works, to the specifications of Messrs. Corbet Woodall and Son: Messrs. Parkinson and W. & B. Cowan, for the supply of a station meter and governor, at a cost of £322 and £94 respectively; and Messrs. W. C. Holmes and Co., for a sulphate of ammonia plant, at a cost of £529.

THE RECENT EXPLOSION IN GRACECHURCH STREET.

A Mysterious Case.

Last Thursday, at the Southwark Union Relief Station, Borough Road, Dr. F. J. Waldo, the Coroner for the City of London and Borough of Southwark, resumed his inquiry into the death of Mr. Onni Levantin, who died after an explosion at his office, No. 31, Gracechurch Street, E.C., under circumstances which were briefly reported in the "JOURNAL" for Oct. 29 (p. 369). It will be remembered that three other persons—one of them deceased's sister-in-law—were seriously injured; and all the sufferers were removed to Guy's Hospital, where Mr. Levantin subsequently died. Mr. Levantin had, as already explained, been missing from home; and his sister-in-law, the landlord, and a locksmith, forced an entrance into his office—it was thought by the aid of a light.

Before proceeding with the evidence, the Coroner pointed out to the Jury the mysterious nature of the affair, which all possible steps had been taken to elucidate. He had the assistance of Captain A. P. H. Desborough, one of His Majesty's Inspectors of Explosives, who was going to give the Court what assistance he could. He had also in attendance Mr. S. G. Gamble, of the Fire Brigade, and Colonel Fox, Chief of the Salvage Corps. The spectroscopic examination of the blood of deceased which it had been arranged at the previous hearing should be carried out, had had negative results. He (the Coroner) thought that in a mysterious case like this it was wise to inquire into the possibility of suicide, and that a toxicological examination should be undertaken. This had accordingly been carried out by Dr. Womack, of St. Bartholomew's Hospital.

The first witness called was the brother-in-law of the deceased, who said he had left nothing to indicate an intention to commit suicide. He had not threatened to take his life, and had no reason to do so. Four or five years ago he came from Finland. He had no mental derangement, nor had he anything to do with explosives, so far as witness was aware. He did not attribute importance to the fact that the door was locked, as he knew this was a very common practice in Continental offices. Indeed, on a previous occasion, a couple of years before, he had called on deceased, and found the door similarly secured. Mr. Ford, a tenant of the same premises, but a floor below, said deceased's sister-in-law came in and asked if he had seen anything of him; and later on he saw the shadows of three people pass his door on the way upstairs. Closely following came the explosion. He did not at that time smell gas or anything peculiar. Afterwards the three persons came down again—the woman in flames, and smelling of celluloid. He went up and found the place was full of smoke. The window of the room was shut, and not broken at all. Though there was no smell of gas then, he had on the previous evening found a gas-jet outside a lavatory near the office not quite turned off. On the landing, one pane of glass was blown out. In the room the gas-bracket, he saw, was broken loose after the explosion; but he did not notice any smell of gas. Witness had heard that there had been a trifling fire in deceased's office some weeks previously, owing to the bursting of a bottle of spirit. The fireman who first entered the room said Mr. Levantin was in his chair. His face was pink, and his lips blue; and his clothes were smouldering. The door was locked; and when he entered the room there were fumes of gas. In the office was a stove with two taps; but he could not say whether they were closed or open. The gas-bracket was hanging away quite loose; but the tap was turned off. His opinion was that there had been a gas explosion. The handles of a workman's basket, and also an umbrella, were smouldering outside the room. There was no fire in the room, except that deceased's clothes were smouldering. In the case of gas explosions, he did not think it was usual for windows to remain intact. The breath of deceased did not smell of gas; neither did his clothes. A policeman then gave evidence that deceased's face and hands were burnt; and he said there was a smell of gas in the room where the explosion had occurred. He could not tell where the smell came from. The bracket seemed loose; but he did not pay any attention to the stove.

Medical testimony was given by Dr. Wynn, who was called in to see the sufferers immediately after the occurrence. He said the woman smelt very strongly of celluloid; and he picked up a hair-comb made of this material on the stairs. Deceased (who was quite unconscious when he saw him, but was breathing normally) was slightly burnt on the left cheek, and his hands were scorched. The left shoulder of his coat was burnt. There was no smell whatever in his breath. If coal gas had been inhaled, he would have expected to have found some smell of it at the mouth. The pupils of the eyes were normal, and the whites were not reddened. The skin of the man's face, except where burnt, was practically of the normal colour. He thought there was a possibility of the cause of the affair being coal gas, or through deceased having thrown down an explosive. Mr. Levantin seemed to be burnt at the back of the neck. He never regained consciousness so as to make a statement. Dr. F. Womack, expert in toxicology, said he had conducted a careful examination of the viscera, blood, &c., of deceased. The result was that he found no trace of metallic or alkaloid poisons—no strychnine or morphine. According to one test he made, carbonic oxide was not present; and another test also gave a negative result. He did not think death was due to anything swallowed or to carbonic oxide poisoning. With coal gas, 1 part in 10,000 would give a characteristic smell; while proportions of 1 part of coal gas to 9 parts of air would give a perfect explosive mixture. In a case of gas poisoning, he would expect to smell gas in the victim's breath. Dr. Kenelm Digby, of Guy's Hospital, expressed the opinion that death was due partly to gas poisoning and partly to shock following the burns, which were very severe.

Mr. Frederick J. Hood, Assistant Chief Inspector of the Gaslight and Coke Company, said he visited the premises the previous Tuesday; and he gave particulars of the sizes of the service, meter, &c., and of the pipe running to the bracket over the mantelpiece. He also stated that the consumption of gas for the December quarter of 1905 was 800 cubic feet, and 600 feet in the corresponding quarter of 1906; while for the period from Sept. 19 to Oct. 23 last, it was 1400 feet—this increase pointing possibly to some leakage. The cubical contents of the room were 927 feet; and by means of a test he arrived at the approximate quantity of gas per hour which would be likely to escape from the open end of the pipe to which the bracket had been originally fixed. This would have possibly accumulated in sufficient quantity to produce on ignition the results experienced. The Coroner discussed at length, on the medical evidence, questions relating to coal gas, mixtures of gases, water gas, carbon monoxide, &c.; and he put questions on these points to Mr. Hood, who explained that, not being connected with the manufacturing branch of the Company's business, he was not in a position to deal with these matters. He, however, stated that the gas was periodically tested; and that one of the official stations for this purpose was situated close to the scene of the explosion—at No. 106, Fenchurch Street. To the best of his knowledge, the gas supplied to Gracechurch Street was made at Bow Common; and, so far as he was aware, water gas was not manufactured there. It was, of course, no secret that carburetted water gas was made by many companies and local authorities. Asked how, if it were a gas explosion, he accounted for the fact that the window in such a small office was not broken, while the bracket was broken off, witness said that, from his examination of the room, he concluded the gas had escaped to such an extent as to be beyond the percentage necessary to cause upon ignition an ordinary explosion. This had naturally accumulated from the ceiling downwards to within (say) 2 or 3 feet of the floor at the time of the explosion (which it had been suggested was caused by the application of a light outside the door). This seemed to be proved by the fact that the damage was confined principally to the burning and scorching of the wall paper, &c., down to about the distance named from the floor, which showed that there had been more damage done by flame than by the concussion. His theory was that when the light was applied to the keyhole, the accumulated explosive mixture in the lower part of the room at once came in contact with the light, followed by the sudden report and a burst of flame inside the room; the force of the explosion being directed towards the door—where the main structural damage occurred. There would be considerable draught up the staircase (the room was on the third floor), and as the landing was very dark, the workman would have been compelled to use a light in his endeavour to pick or force the lock; and possibly in the excitement, with deceased's friends present, he did not notice any smell of gas from the outside. As the concussion was insufficient to break the window, it was, in his opinion, insufficient to dislodge the bracket. Asked if he considered the bracket had been pulled down, witness replied that he was not prepared to say this had been done intentionally; but the bracket had certainly not been blown down. Supposing deceased had been sleeping, and, having awakened in the dark, had gone towards the bracket with the intention of getting a light, had taken hold of the tap, missed his footing, and caught hold of the bracket, this, to his mind, would have been sufficient to break it. The bracket was of a very frail type; and he would like to point out that the fittings were neither supplied nor fixed by his Company. Of course, the gas could have been shut off at the meter, which was situated immediately outside the office door.

The next witness was Colonel Fox, of the Salvage Corps, who thought, in spite of the fact that the window was not broken, that the explosion was caused by gas, and that the damage to the bracket was not occasioned by the explosion. He was entirely in agreement with what Mr. Hood had said with regard to the gas having accumulated from the ceiling downwards. Outside the door of the room, he stated, a piece of candle was found. Captain Desborough also expressed the conviction that the explosion was caused by gas of some sort, and not by anything in the nature of gunpowder.

At this point, the inquiry was again adjourned.

THE GAS EXPLOSION IN DUBLIN.

Last Saturday week, a disastrous gas explosion occurred on the premises of Messrs. Forrest and Son, Grafton Street, Dublin, under circumstances which were briefly recorded in the "JOURNAL" for the 5th inst. The front of the building was reduced to ruins; while the interior of the drapery shop was gutted by the fire which subsequently broke out. In addition to this, a maid-servant employed in the establishment suffered a broken collar-bone and other injuries.

It appears that the injured domestic, Mary Murphy, was on the morning of the accident engaged in lighting fires in the lower rooms of the premises; and having lighted the front kitchen fire, she left to attend a back kitchen fire. Scarcely had she proceeded on her way, when there was a rush of gas, and she was immediately thrown back. About this time, a policeman happened to be passing; and he saw the plate-glass windows of the shop fly into both Wicklow Street and Grafton Street. Subsequent to the gas explosion, which also was responsible for the collapse of some of the floors, a fire broke out; and the brigade were promptly on the scene. They found, however, that the work of destruction had been accomplished by the gas explosion, and that fighting the fire was comparatively easy. The injured girl stated that she had lighted no gas during the morning. There were on the premises at the time of the explosion some twelve persons altogether; but fortunately none other than the servant referred to sustained any hurt. The damage was roughly put at £20,000. Slight damage, in the way of broken windows, &c., was suffered by several other firms in the vicinity.

Barry Gas Manager and the Council.—It was reported at a special meeting of the Barry Urban District Council that Mr. J. A. Hughes, Solicitor, had sent a reply in reference to the claim made by Mr. F. M. Harris, the Gas Engineer, for £643 as commission on new works (*ante*, p. 442). In this letter particulars were afforded of the expenditure on new works on which the claim of 2¼ per cent. was based; and it added that the Gas and Water Company, who formerly owned the works, had engaged Mr. Harris on terms which included the payment of commission on new works. The Council decided to discuss the matter in private.

DISPOSAL OF GAS PROFITS AT BELFAST.

Addressing the members of the Belfast County Borough Council at the quarterly meeting a few days ago, Mr. J. A. Doran, the Chairman of the Gas Committee, made some remarks on the subject of the disposal of gas profits; the sums allocated in this way to various purposes having in the past been of very considerable amount.

After pointing out that the coal and oil contracts for the ensuing twelve months would involve an increased outlay amounting to £22,000, he said they were all aware that the Gas Committee had been in the habit of making an annual grant to the Finance Committee in aid of the rates, besides paying dividends and sinking fund contributions on stock issued for erecting the new City Hall. These extra payments had varied in amount, being generally about £25,000. But, owing to pressing need, they consented to give £30,000 for the current year, and this brought up the total of their contributions to the various schemes of the City Council to over £210,000 since the works were taken over. The grants had not been confined to any one object, but had been spread over a large number of the improvements carried out by the Corporation. In face of the great increase in the price of materials, he was afraid the time had come when these grants must cease—in fact, when they would be compelled to stop them for want of funds. They had bound themselves to the payment of the City Hall dividends and sinking fund for ten years, one year of which was still unexpired; and they must in some way try to meet this. It would, however, be utterly impossible for them to think of continuing the other large contributions, under present conditions, after the expiration of the current year. They had now the new City Hall fully completed; and up to the present the general body of the ratepayers had not been called upon to pay a penny towards its construction—the whole amount having been contributed by the gas consumers. As a Committee, they were of opinion that this burden should be transferred to some other shoulders—say, the tramways or electricity undertaking. He thought this would be a good opportunity for either of these departments to show what they could do. He wished the Finance Committee to have due warning of their intentions, so that there might be no disappointment when the time for making next year's estimates came round.

PAISLEY CORPORATION GAS SUPPLY.

Annual Report and Accounts.

The report of the Gas Committee of the Corporation of Paisley, with the accounts of the gas undertaking for the year ending the 15th of May last, have been issued as part of the statistics relating to the revenue-producing undertakings of the Corporation. They show that the gross revenue was £59,349, and the gross expenditure £46,777; so that the balance carried to the net revenue account was £12,572. Out of this the following sums had to be provided: Sinking fund, £1746; interest, £3655; property and income tax, £337; and depreciation, £1187—in all, £6925—leaving a surplus of £5646 for the year. A balance of £398 was brought forward, and this added to the surplus made a total of £6044. The revenue account shows that the sale of gas for private and public lighting, motive power, &c., produced £47,275; residuals yielded £11,926 (being £6563 for coke, and £5363 for ammoniacal liquor and tar); and £148 received from the Lighting Department for the erection of lamp-pillars, &c., made up the total of £59,349 already mentioned. The expenditure on the manufacture of gas was £37,375; on distribution, £2969; on rents, rates, taxes, and insurance, £4268; on management, £1612; and on miscellaneous matters, £551. Turning to the statistics in regard to gas manufacture, we find that 43,216 tons of coal and the equivalent of oil were used, at an average price of 11s. 1·6d. per ton. The quantity of gas sent from the works was 446,616,000 cubic feet, of which 416,927,000 cubic feet were accounted for; the latter figures including 6,749,951 cubic feet used in the works and meter-shops, and 1,224,300 cubic feet for gas-engines on the works. The unaccounted-for gas amounted to 6·65 per cent. The average illuminating power of the gas supplied was 20·41 candles (the prescribed quality being only 16 candles); and the charge was at the rate of 2s. 4d. per 1000 cubic feet to ordinary consumers, 2s. 2d. to the Police Commissioners for the public lamps, 3s. 4d. to prepayment consumers, and 1s. 10½d. for motive power and commercial purposes. For these 29,384,500 cubic feet, or 7·05 per cent. of the entire output, were used. During the year, 1349 cooking-stoves and range-plates and 1217 grillers were fixed. The number of meters at present in use is 23,112, of which 883 are of the prepayment kind. The Committee report that, under the supervision of Mr. George R. Hislop, the Gas Engineer and Manager, all the works and plant were maintained in good condition throughout the year, and the necessary cost, as usual, defrayed out of capital. The coal-handling plant and the retort-charging machinery at the works are partly in use and will shortly be in full operation.

HUDDERSFIELD CORPORATION GAS SUPPLY.

The Working of the Undertaking in the Past Year.

As is customary at the meeting of the Huddersfield Town Council on the 9th of November, the MAYOR (Alderman Balmforth) on Saturday presented to the members a statement relating to the working of all the undertakings of the Corporation in the past financial year. Dealing with the Gas Department (of which Mr. E. A. Harman, M.Inst.C.E., is Engineer and Manager), he furnished the following particulars.

During the year ending March last, the Gas Department established a record in the quantity of gas sold; the amount being upwards of 684 million cubic feet, compared with 624 millions in the previous year. The continuous growth of the department during the past ten years is shown by the fact that the gas sold has increased by 168 million cubic feet, or more than 32 per cent.; the quantity sold in the year 1897 being 516 million cubic feet. Considerable benefit has accrued from the almost general adoption of gas-cooking stoves; and the prepayment meter system has also enormously advanced. In the year 1897, the amount collected through this source was £133; whereas for the year ending March last it amounted to £21,642. Concurrently with the increased output of gas have been the great improvements effected in gas-burners for illumination purposes, whereby a larger amount of light has been secured at a reduced consumption of gas. In 1897, the total gas consumers numbered 20,016, while in 1907 they had increased to 26,515, or 32 per cent. more. These increases, while naturally adding to the Gas Committee's responsibility, have nevertheless been partly the means of their being able to reduce the price of gas; the present charges being 2s. 3d. per 1000 cubic feet for lighting and 1s. 6d. for motive power and heating purposes (less 5 per cent. discount), and the prepayment consumers being supplied at the rate of 36 cubic feet for 1d. net. During the year the wages of the workmen were considered and advances made to them. For the year 1907, the income of the department amounted to £97,149, and the gross or trading profit to £27,916; being 8 65 per cent. upon the whole capital expended. The profit was allocated as follows: Interest on loans, &c., £11,890; sinking fund, £1795; depreciation and contingencies fund, £10,545; and relief of rates (2d. in the pound), £3686. The capital expended on the works remains at £322,655; and the amount accumulated towards its redemption is £86,573. During the year the Committee have negotiated contracts for coal at an increased price over the previous year. This, coupled with the reduced charges for gas already alluded to, renders it extremely probable that little or no profit will be forthcoming at the end of the current financial year. It is generally known that the Gas Committee is by far the largest ratepayer. The amount paid for borough, district, and poor rates during the financial year amounted to £5432. But, in addition thereto, a contribution of £3686 to the relief of the rates was made—being equivalent to 2d. in the pound upon the whole rateable value of the town. During the past ten years, these contributions have amounted to £27,508. Having regard to the age of many portions of the apparatus and plant at the gas-works, the Committee have set aside a sum of £31,161 as a depreciation and contingencies account. This will have to be greatly increased, as a new gasholder is becoming a necessity, and its provision will require a far larger amount than the whole sum at present available. The Byram Street show-room and order office was well used during the year, and has proved very convenient to the consumers and of great service to the department. The demand for gas-cookers and gas-fires is still very large; and the fact that few towns have so high a percentage of appliances to the number of consumers as has Huddersfield is splendid testimony to the appreciation by the inhabitants of the utility and advantages of cooking and heating by gas, and also to the soundness of the Committee's policy in letting out cooking and heating stoves upon advantageous terms. The Mayor concluded by expressing the opinion that in the gas undertaking the town possesses a valuable asset.

ELECTRIC LIGHTING AT MONMOUTH.

Corporation Methods Strongly Criticized.

The inquiry into the application to the Local Government Board by the Monmouth Town Council for authority to borrow £10,000, for the purpose of defraying expenses incurred in connection with their electric light undertaking, was resumed last Tuesday, by Mr. H. R. HOOPER, M.Inst.C.E., one of the Board's Inspectors. It may be remembered that the inquiry was opened on the 3rd ult. (see *ante*, p. 115), and was adjourned for a month.

The INSPECTOR, on taking his seat, said the inquiry was adjourned in order to get further particulars with regard to the expenditure incurred on the electric light and the sewage works. These had now been furnished, and he proposed to go through the main items of expenditure in order to have an explanation as to the amounts paid. He and Mr. Tweedy, the Borough Treasurer, examined a number of accounts the previous day, and the position appeared to be that there was a sum of £975 14s. 2d. owing to the bank on the 3rd of October last on the electric lighting account. With regard to the sewage account, there was owing to the bank the sum of £1602 18s. 3d. Deducting certain items, the total owing at the present time was £11,041 5s. 4d.; and, substantially, it was £11,000 for the sewage and the electric light works. He asked the Town Clerk if he had any proposition to make in regard to this amount.

The TOWN CLERK (Mr. B. H. Deakin) said the Corporation applied for sanction to borrow to the fullest extent of their statutory powers; and they asked for the maximum period—viz., thirty years—for the repayment of the loan.

The INSPECTOR: In connection with the electricity undertaking, you have a debt of close upon £10,000 for the last six years. In asking for a period of thirty years, it is quite clear that you ignore the fact that a great deal of money has been spent for some time. Would thirty years be a proper period to apply for, having regard to the time that has elapsed and in the absence of a sinking fund?

The TOWN CLERK replied that the Corporation left themselves in the hands of the Board; they had no proposition to make.

The INSPECTOR remarked that they simply submitted the position to the Board and asked permission to borrow an amount equal to twice the assessable value of the town. Their borrowing powers came within about £4000 of what they had actually spent.

A number of questions were then put to the Town Clerk by the Inspector, in regard to the details of the contracts entered into; and the following particulars were elicited. The contractor offered to do certain work for £4847, and he was paid £7081, or an excess of £2234. The Corporation were not in possession of a single account from this contractor—nothing but the engineers' certificates to show that a certain amount was due to him. The Inspector pointed out that they were without a single detail to show how the £7081 had been spent.

The Town Clerk entered into a long explanatory statement in regard to certain legal proceedings taken by the contractor; but it was not satisfactory to the Inspector, who said this was a question of public money paid without even asking for the particulars. There was not only one amount, but others relating to upwards of £40,000 for which he had not a single detail as to expenditure. They must add them up, and see how the position stood in regard to the information the Council had when they paid away between £40,000 and £50,000. It was impossible for the Town Clerk to say whether or not an account had been paid twice over. There was nothing on the certificates.

The investigation of another contract was then proceeded with. It was for £12,939; but beyond accounts amounting to a few hundred pounds, which appeared to have been furnished to the Corporation direct, no details were available. At this point the Chairman of the Lighting Committee, (Mr. Honeyfield) interposed a remark to the effect that there had been a change in both the Town Clerk and Treasurer, and that "in turning over offices many documents had been lost." The Town Clerk said the Treasurer had acted upon certificates received by him (the speaker). He received them from the engineers and submitted them to the Council, and they made orders for payment. The practice was to hand over to the Treasurer the certificates and the orders for payment. The Inspector remarked that the Council must be satisfied that the amount had been properly incurred. They might put their faith in their engineers; but the responsibility would rest entirely upon the Council. They could not shift it. But they had not taken a single step to satisfy themselves that accounts amounting to close upon £40,000 had even been added up correctly. The Town Clerk said he could not alter the fact; whereupon the Inspector replied that he was there to ascertain the position, and must have everything clear. It was perfectly certain that a considerable portion of the £7000 spent on the first contract investigated had been wasted—that was to say, had been paid for work done twice over. The Corporation were applying for money for doing work two or three times.

In the course of further investigation, the Inspector pointed out that a cable had been laid by the Council in a certain street without waiting for consumers; and, addressing Mr. Honeyfield, he said: "This money has been entirely wasted; there is no other word for it." The gentleman addressed explained that the cables were put in to the specification of the engineers—a remark which, as will be seen from what follows, only evoked some severe criticism.

The Inspector: The Council are responsible for the undertaking. You were Chairman of the Committee, and had a cable put down without any prospective consumers. It is clear evidence of ineptitude and waste. It is no wonder the undertaking does not pay. All through this inquiry, it seems clearly to be the intention of the Council to disclaim responsibility.

Mr. Honeyfield: No doubt the Committee were disappointed.

The Inspector: It is not a question of disappointment. There was no occasion to lay cables in a street until there was a demand. This action is apparently through ineptitude and ignorance. That is all it is, Sir; it is over-speculation. You actually lay cables where there are no consumers.

Mr. Honeyfield: We are wise after the event.

The Inspector: Careful warning was given to the Council before the undertaking. You thought to save 7d. in the pound, and the result has been a loss of 8½d. in the pound up to the present, without a single penny towards a depreciation fund.

Mr. Honeyfield said they trusted they were laying a foundation for the future.

The Inspector: You have had eight years at it, and know the result.

Colonel Walwyn, who was Mayor in 1898, said the Council were not satisfied with the way things were going on. Personally, he did not hold with certificates being taken without verification; and he did his best to stop the practice. Inquiry had been resisted; but he felt that the time had now come when a large ratepayer like himself should say something, or else it would be declared that no one objected. He attended the inquiry as a public man, for he felt most indignant. When his term as Mayor was finished, he walked out of the room and said he would never enter it again; and he had not done so. The place had been ruined in consequence of the way things had been carried on.

After some further inquiry, payments to the amount of £45,056 were agreed to as correct.

The Inspector: The whole of the expenditure involved comes to £51,388; and the total of the books kept is one cash-book!

Colonel Walwyn asked that, if the money was granted, a public auditor should look into the accounts when the matter was completed, as the Corporation seemed to be altogether unfit to look after any sum of money.

Mr. F. Hobbs, as a ratepayer and the representative of several others, endorsed Colonel Walwyn's remarks as to an audit. He said if the accounts had been publicly audited in the past, much trouble would have been saved.

Mr. H. T. Simmonds asked that as long a period as possible might be granted for repaying the money, as he had been told by ratepayers that they felt the burden heavily.

The Town Clerk expressed the hope that the Local Government Board would press the Public Works Loan Commissioners to grant them the loan repayable during a long term.

The Inspector said he supposed they could be allowed to exercise their discretion.

The inquiry then closed.

Increased Meter-Rents at Kingston.—The Directors of the Kingston-on-Thames Gas Company announce that their contracts for the supply of coal and oil for the next twelve months have been made at prices seriously higher than those of last year; and as an alternative to raising the price of gas, they have decided to increase the rents charged for the hire of meters. The rates of hire will from Christmas next, range from 1s. a quarter for a 3-light meter to 10s. for a 300-light meter.

Gas-Workers' Wages at Oldham.—The Oldham Gas Committee have been considering a letter from Mr. J. R. Clynes, M.P., Lancashire Organizing Secretary of the National Union of Gas-Workers and Labourers, respecting the reply of the Committee to the men's application for increased wages and holidays with pay. Mr. Clynes expressed disappointment and regret at the decision come to, and urged that the claim be further considered, and a deputation of the men be received. A discussion took place as to whether the figures of other corporations as to wages and hours should be supplied to the Union; but Mr. Arthur Andrew, the General Manager, said the information was supplied to the Committee confidentially. It was decided that a deputation of one man from each department, along with Mr. Clynes, should be received at the meeting a month hence.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 473.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct 11	10½	Alliance & Dublin 10 p.c.	19—20	−1	5 5 0
268,324	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Oct. 30	7	Bombay, Ltd.	6½—6¾*	..	5 3 8
40,000	5	,,	7	Do. New, £4 paid	4½—5*	..	5 12 0
50,000	10	Aug. 29	14	Bourne-mouth Gas and Water } 10 p.c. B 7 p.c. Pref. 6 p.c.	27½—28½	..	4 18 3
51,810	10	,,	7		16¾—16¾	..	4 3 7
53,200	10	,,	6		14½—15½	..	3 17 5
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	243—248	−2	5 0 10
300,000	,,	,,	9½	Do. New	185—190	..	5 0 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	115—120	..	4 3 4
206,250	,,	June 13	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	215—220	..	5 2 3
246,320	,,	,,	8½	Do. A. Ord. Stk.	155—160	..	5 3 2
460,000	20	,,	10	British	40—41	−½	4 17 7
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	116—119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c.	87—90	..	5 0 0
500,000	10	Oct. 11	7	Buenos Ayres (New) Ltd.	10¾—11¼	..	6 4 5
250,000	Stk.	June 27	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
150,000	20	July 12	8½	Cagliari, Ltd.	26½—27½	..	6 0 0
100,000	10	—	—	Cape Town & Dis., Ltd.	6—8	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	7—9	..	5 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—50*	..	6 0 0
100,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	94—96	..	4 13 9
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108—110	+1½	4 10 11
1,443,280	Stk.	,, 29	5⅞	Commercial 4 p.c Stk.	100—105	..	4 19 0
560,000	,,	,,	5	Do. 3½ p.c. do.	98—103	..	4 17 1
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	110—115	..	5 13 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
460,170	Stk.	—	5½	Derby Con. Stk.	123—125	..	4 8 0
55,000	,,	—	4	Do. Deb. Stk.	102—104	..	3 16 11
486,090	10	July 31	12	European, Ltd.	22½—23½	..	5 2 2
354,060	10	,,	12	Do. £7 10s. paid	17½—18½	..	4 17 4
15,182,590	Stk.	Aug. 15	4⅛	Gas-light and Coke } 4 p.c. Ord.	90—92	−1	4 15 8
2,600,000	,,	,,	3½	3½ p.c. max.	86—88	..	3 19 7
3,799,735	,,	,,	4	4 p.c. Con. Pref.	103—106	−½	3 15 6
4,193,975	,,	June 13	3	3 p.c. Con. Deb.	81—83	..	3 12 3
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	93—98	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	114—117	..	5 11 1
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	19—20	..	5 10 0
4,940,000	Stk.	May 15	8	Imperial Continental	173—175	−2	4 11 5
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	91—93	..	3 15 3
195,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	110—120	..	5 0 0
306,083	,,	June 27	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9
561,000	Stk.	Aug. 29	10	Liverpool United A	221—223	..	4 9 8
718,100	,,	,,	7	Do. B	160—161	−½	4 6 11
152,736	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142—147	..	5 3 8
75,000	5	June 27	5	Malta & Medn., Ltd.	4—4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	99—101	−1	4 19 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 30	3½	Monte Video, Ltd.	10½—11½	..	6 1 9
1,775,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	106½—107½	−½	4 6 1
406,025	Stk.	June 27	3½	Do. 3½ p.c. Deb.	89—91	..	3 16 11
15,000	10	Aug. 29	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Apl. 26	8	Oriental, Ltd.	140—145	..	5 10 4
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Oct. 30	7	Primitiva Ord.	6½—7*	..	5 0 0
796,980	5	July 31	5	Do. 5 p.c. Pref.	4¼—5¼	..	4 17 7
488,900	100	June 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
1,000,000	10	Oct. 11	8	River Plate Ord.	12½—13	..	6 3 1
312,650	Stk.	June 27	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	July 1	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	242—244	..	4 2 0
209,984	,,	,,	10	Do. B	242—244	..	4 2 0
523,500	,,	,,	10	Do. C	242—244	..	4 2 0
70,000	10	June 13	10	South African	15—16	..	6 5 0
6,429,895	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	119—121	..	4 10 11
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	81—83	..	3 12 3
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	155—157	..	5 1 11
605,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	114—117	..	4 14 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
502,310	Stk.	May 15	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Aug. 15	6¾	Tottenham A 5 p.c.	120—123	..	5 9 9
398,940	,,	,,	5¼	and B 3½ p.c.	100—103	..	5 1 11
149,470	,,	June 27	4	Edmonton 4 p.c. Deb.	99—101	..	3 19 3
182,380	10	June 13	8	Tuscan, Ltd.	10¼—10¾	..	7 8 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
193,742	Stk.	Aug. 29	5	Tynemouth 5 p.c. max.	107—109	..	4 11 9
30,000	Stk.	Feb. 14	8	Wands-worth A 5 p.c.	—	..	—
255,636	,,	Aug. 15	6½	B 3½ p.c.	128—133	..	4 17 9
75,000	,,	,,	5⅝	and C 3½ p.c.	—	..	—
80,075	,,	June 27	3	Putney 3 p.c. Deb. Stk.	75—80	−1	3 15 0
845,872	,,	Aug. 15	5⅜	West Ham 5 p.c. Ord.	102—105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
228,300	,,	June 27	4	Do. 4 p.c. Deb. Stk.	101—104	..	3 16 11

Prices marked * are "Ex div."

GROWTH OF LABOUR CO-PARTNERSHIP.

At the Annual Meeting of the Labour Co-Partnership Association last Thursday—Mr. Amos Mann, the Vice-President, in the chair—the report which was presented set forth that the latest figures concerning the progress of co-partnership schemes among gas companies showed that the total sum credited to employees for the year ending June last was £55,199, and the aggregate sum since the schemes were adopted was £451,944. The 7281 employees held at the end of the period £392,767 in the capital of the various companies. It was expected that after a comparatively short time these employees would possess £1,000,000 capital in the companies with which they were connected. Under the investment scheme in Sir W. G. Armstrong, Whitworth, and Co., Limited, the amount of capital owned by the employees had increased from £124,306 in 1901 to £214,800 last year. It was evident that co-partnership for employees was not inconsistent with the welfare of the shareholders, for in one concern which divided a profit amounting to 10 per cent. on wages among the employees, capital received a share of profit amounting to 10 per cent., and 4½ per cent. interest in addition—a total of 14½ per cent. in all. The report further showed that the town in which the labour co-partnership organized by workers advanced with the greatest strides was Kettering, in which there are now five societies having £65,000 capital, and doing an annual trade of £162,000. The report having been unanimously adopted, Mr. J. M. Ludlow proposed that Mr. A. J. Balfour, M.P., be elected President for the ensuing year, and congratulated the members on the fact that the leader of the Opposition had accepted co-operation, and was ready to endorse it with his efforts. The motion was carried unanimously. Mr. Henry Vivian, M.P., was re-elected Secretary.

Mr. Aneurin Williams then opened a discussion on "Co-Partnership in Relation to Public Employment." He said the Association was not in favour of any great extension in what might be called State or municipal employment, nor did it oppose any such extension. Both the Socialist and the Individualist were members of the Association, and worked harmoniously; each thinking that co-partnership principles favoured his own policy. The great principle should be carried out that the worker should be interested in the result of his work, so that his duty and his interest should lie in the same direction. It should be admitted that, so far, there was practically no acknowledgment of the principle of co-partnership in public employment. Where a branch of it was worked for a profit, he could not see why the workers could not share in it, just as they at present did in the profits of many private concerns. In a department of public work not carried on for profit, there could not be profit-sharing in the ordinary sense; but there could be what was called gain-sharing, and employees could be given an interest in the economy secured by the work that they were doing. Mr. E. O. Greening suggested the grant to Government employees of Government stock according to the profits of the department in which they worked. Other speakers advocated giving municipal workers some interest in their work beyond mere wage-earning. Mr. Vivian expressed the opinion that the moral effect of co-partnership could not but have most beneficial results. In a letter expressing regret at inability to attend, Sir George Livesey alluded to the settlement of the railway difficulty, and said it added to his pleasure to find that the Joint Committee would be practically the same as their Co-Partnership Committee, which he hailed as a first step towards co-partnership in railway companies. A resolution was passed heartily welcoming the settlement of the railway dispute as some recognition of the partnership of capital and labour in industry—a principle for which the Association had worked for many years. Mr. Vivian remarked that, although there was to be no profit-sharing, the scheme arrived at through the instrumentality of Mr. Lloyd-George was a public recognition of John Stuart Mill's ideal with regard to labour, and a distinct victory for the movement represented by the Association.

ANCIENT AND MODERN WATER SUPPLIES.

At a recent Meeting of the Bristol Association of Engineers, an interesting paper on this subject was read by Mr. J. A. M'Pherson, M.Inst.C.E., the Chief Engineer of the Bristol Water Company.

The earliest methods of obtaining water and the antiquity of wells were commented upon; mention being made of the very numerous ancient deep wells to be met with in the East, and of the discovery of public wells by the excavations at Pompeii. The supply of water to Jerusalem and the ancient aqueducts for the supply of Carthage, Athens, and Corinth were allude l to. Special reference was made to the water supply of ancient Rome, as described in the essay of Frontinus, the Water Commissioner of Rome A.D. 97, from translations by Clemens Herschel. The eleven aqueducts which supplied ancient Rome were described, and particulars were given of the distributing system, of the measurement and allotment of the water, and of the water-fittings in use—attention being directed to their similarity to modern appliances. Some account was also furnished of the great works for water supply carried out by the Romans for Constantinople, as well as in Spain and France, and other countries under their dominion. Reference was made to the magnitude of the works for water supply in ancient Mexico and Peru, and to the antiquity of the tanks and cisterns found in India. The early history of Paris, London, and other water supplies was next touched upon. The first works for Paris, it was pointed out, were made under the patronage of the religious bodies. Some particulars were given of the supply to Paris in the time of Henry IV., and of the early supply from the Seine and other sources. The supply to London was outlined from the time of the Conqueror; and the origin of the New River Company and the subsequent inception of the other London Water Companies were referred to.

A short description was given of the early water supply of certain

WEST END ART ROBBERIES.

During the hearing of a case at the Westminster Police Court recently, in which certain persons were charged with stealing and receiving old miniatures, it was stated that in a DISUSED GAS-STOVE some broken gold and ormolu frames were found.

That Stove could not have been a RICHMOND

for a Richmond once used for cooking is always USED.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

other towns, followed by an account of the first Company, founded in 1695, for supplying Bristol with water drawn from the Avon at Hanham, and conveyed to a reservoir at Lawrence Hill. Specimens were shown of the elm pipes that have been discovered from time to time in excavating the Bristol streets. The proposal made in 1811 for a supply to Bristol by means of a canal between Bath and Bristol, and the tapping in the same year of the Zion Spring for the supply of houses in Clifton were mentioned. An attempt to form a Bristol and Clifton Water Company in 1840 was next referred to, and also the efforts of the Merchant Venturers' Society in 1841 to supply Clifton and the neighbourhood; likewise the works proposed by the same Society in 1845 for tapping springs at Sea Walls, and for a reservoir at Observatory Hill. Reference was also made to the Water Supply, Drainage, and Improvement Company's unsuccessful attempts at that time to supply Bristol, and to the inquiries by Her late Majesty's Commission, and their unfavourable report upon the health of the city and the unsatisfactory condition of the water. The struggle between the Merchant Venturers and the promoters of the Bristol Water Company and the eventual formation of the present Company were touched upon.

Modern water-works development was then dealt with. The Metropolitan Water Board's great undertaking was described, and short accounts were given of the present supplies of Manchester, Liverpool, Birmingham, and other large English towns, and of the Derwent Valley water scheme now in progress. The reference to English towns concluded with a short account of the Bristol Water Company's present supply of about 9½ million gallons daily, to a population of nearly 400,000, from pumping and gravitation sources; the length of mains for conveying and distributing the water being over 400 miles, and the total storage capacity at Blagdon and Barrow being 2570 million gallons. The principal Scotch, Irish, and Welsh town supplies were enumerated.

Colonial water-works undertakings were touched upon. The Cataract dam—the largest impounding scheme in the Southern Hemisphere—for the storage of 27,000 million gallons of water for the supply of Sydney, was referred to, and special mention made of the Coolgardie water supply, which Mr. M'Pherson described as a scheme unique among water undertakings. The principal works for the supply of Calcutta and Bombay were noticed, and the modern supplies of Paris and Berlin referred to.

The paper concluded with some account of the colossal water undertakings in the United States. Greater New York's supply of 530 million gallons a day for a population of 4,700,000, or 113 gallons per head, was commented on, and this excessive rate was compared with that of London. It was stated that the available storage, which will ultimately amount to 100,000 million gallons in the Croton and other watersheds, is already considered to be insufficient for the near future, and that steps have been already taken for obtaining fresh sources of supply from the watershed of the Catskill Mountains, which will enable additional storage to be provided of 163,000 million gallons.

A discussion followed the reading of the paper; and the President having replied, the meeting closed with a vote of thanks to him.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

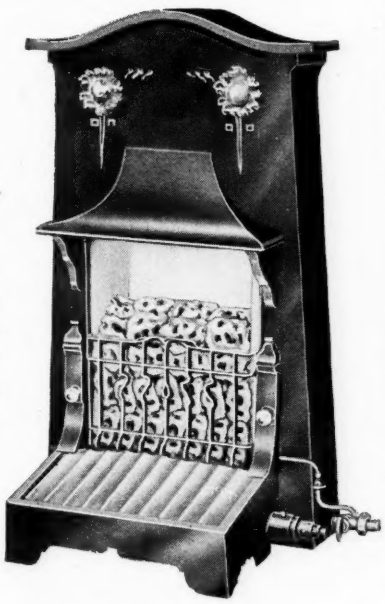
Saturday.

The meeting to-night of the Western District of the Scottish Junior Gas Association was again a most successful one. There was a happy conception in the arrangement for it, in respect that the gentleman who figured chiefly in the proceedings was Mr. H. Rule, of Falkirk, who is a member of the Eastern District. This is the first time there has been an interchange of services between the two districts. It is a step upon which there is good reason to congratulate both districts. Mr. Rule's paper was an amplification of one which he gave to the Eastern District in January last, but bringing the results of the work ing of the stoking machinery at the Falkirk Corporation Gas-Works down to date. The descriptive part of it was therefore not new to those who read. There was, of course, a large amount of new information, which is most valuable, and well deserved the thanks which Mr. Rule received from the meeting. But the principal value of the contribution, I think everyone will admit, was in the diagrams which were used to illustrate the letterpress. The set was a most complete one, very skilfully and attractively prepared, and altogether such as showed, at a glance, the design of the machines which were being described, and the particular points which the author wished to lay emphasis upon. There was a discussion upon the paper which was well sustained, and must have been very encouraging to Mr. Rule. The meeting was asked to discuss questions submitted; and the remarks that were made upon them were most interesting, particularly upon the last question, relating to the weight and duration of charges. Upon it, Mr. Myers' contribution, giving the results of some tests he carried out in order that he might settle his own policy upon sure ground, and Mr. MacLeod's criticism of these results, brought out how decidedly distinct opinions may be held upon even the most elementary subjects, and the need there is, in this instance, for closer observation. The subject is continued till next meeting; so there will be time for the members to search for the highest authorities upon the practice of charging, and thereby lead to another profitable discussion. Mr. Myers' remarks, whether agreed with or not, bring out clearly a weakness in the procedure of putting forward set questions, as was exemplified in the treatment of the first two, which is the submission of a question without having arranged that someone should take the lead in discussing it. The first two questions went a-begging for this want; the third was at once put on the rails by Mr. Myers, with a most satisfactory result.

In the Kirkcaldy Town Council last night, it was reported that a letter had been received from the Secretary of the Kirkcaldy Gaslight Company, Limited, stating, with reference to questions which had been put to them, that the Directors presumed the following might be taken as the questions submitted: (1) Whether the Gas Company have any agreement with the Town Council that they are not to pay a dividend of more than 7½ per cent.; and (2) whether the dividend at present

A Novelty.

OUR No. 15 "Diamond" Fire fitted with Bye-pass and Reflector Fender Front—two of the features which place the "Diamond" Series in the very forefront of Modern Heating Appliances.



THE DAVIS GAS STOVE COMPANY, LTD.,
London, Luton, and Manchester.
London Show-Rooms: 59, Queen Victoria Street, E.C.

DAVIS the Gas Stove People.

paid to the shareholders represents 22½ per cent. on the money contributed by the shareholders. In reply, the Directors stated that there never was any such agreement, and that the only agreement with the Town Council was that the Council should receive a discount of 25 per cent. from the ordinary price for gas employed for street lighting. The statement as to dividend was certainly not accurate. There are practically now no original shareholders in existence, and very few shareholders who can be said to represent the original shareholders. Further, much the greater part of the increased capital of the Company has arisen from money contributed by the shareholders, and not in the manner insinuated. Most of the present shareholders have acquired their shares by purchase, either from the Company or from previous shareholders, and this at prices which yielded them a very moderate return on their money—certainly nothing like 7½ per cent., much less anything like 22½ per cent. The Directors did not feel called upon to take any notice of letters which had appeared in the local Press; and while they were accountable for the business to their shareholders only, and not to the Town Council, they felt it but courteous to send a reply to the Council's letter. They, however, wished it to be clarly understood that they could not undertake to continue further correspondence on the subject. In regard to testing the gas, the Directors were willing to allow the Inspector of Lighting to come to the works once a month to test the gas; making use of the Company's apparatus for the purpose. Mr. Miller did not consider the reply satisfactory. Councillor Thom was rather surprised at the letter of the Directors. They stated that they had no agreement with the Council; he wondered what right the Company had to open up their streets. There surely must be some agreement. Mr. Brodie called attention to the gas tests. He thought the Lighting Inspector should be allowed to pay surprise visits. Mr. Thom moved that they procure apparatus for testing the gas. The police or Mr. Braid should be supplied with such apparatus. The subject of having tests of pressure was sent to the Streets Committee to consider and report.

Treasurer Birnie, addressing the electors of Inverness, said that the debt of the town was less than that of the twenty-two largest towns in Scotland. It was £1 1s. 7d. in the pound of the valuation; and the average for the other towns was £2 2s. 3d. Of the debt of £147,000, the amount for gas and water was £120,000 (for gas it is £55,000). The gas-works and main pipes were valued at £67,000; but if a private company bought them at this price they would be bankrupt in two or three years. He did not doubt that most of them would live to see the day when the gas-works would be a dead asset. For years they were overcharged for gas, and the Corporation had gathered together a surplus of over £15,000, which enabled them to supply present consumers at less than cost price. When the surplus was exhausted, the price of gas would go up with a bound.

The Nairn Gaslight Company, Limited, have, at considerable expense, laid a new main from their works to the railway station, and also along Church Street. The work has had the desired effect of affording better lighting, and also in doing away with the bad leaks which the Company have suffered severely from.

Mr. Andrew Whyte, Chief Inspector of Weights and Measures in Aberdeen, has reported to the Town Council regarding the work of his department. Dealing with the testing of gas-meters, he states that the number tested during the past year was 957, and the fees collected amounted to £27 5s. Of the meters tested, 902 were for the Corporation Gas Department, after repairs; and of these 20 were found to be not in accordance with the Sale of Gas Act, and were not stamped, but returned to the works for readjustment. The remaining 55 were tested for consumers; and 18 of them were found correct. The other 37, not being in conformity with the Act, were certified as such, and returned to the gas-works for repairs; the fees being charged against that department.

It was intimated in the Fraserburgh Town Council on Thursday that, owing to the absence from home of Mr. Edward Gordon, the Convener of the Special Committee appointed to obtain the services of an expert in gas and electric lighting, to submit his opinion as to whether it would be preferable to acquire the present gas-works or to introduce electric lighting, no meeting of the Committee had been called. A letter from Mr. Gordon was read, in which he tendered his resignation of the convenership. Mr. John Anderson was proposed as Convener; but he declined. No further action was taken, so that it would appear that the subject has been dropped in the meantime.

At the last meeting of the Kirkcudbright Town Council, the Gas Committee recommended that the price of gas for lighting purposes be reduced by 5d. per 1000 cubic feet, making it 5s. 10d. Mr. Clark, in moving approval of the recommendation, said that this was the second reduction within twelve months. Mr. Brown, the Convener, seconded, and said that if those who at present burned oil would take in gas, they would soon be able to reduce the price further.

The Perth water supply is not in a healthy condition. A week or two ago the available water was down to as low as four-and-a-half days' supply. In a report submitted to the Town Council by Mr. A. Davidson, the Water Engineer, it was stated that for many years, owing to leaking walls, one-third of the storage capacity of the old Burghmuir reservoir, or 207,650 gallons per day, have been lost. The new reservoir there is connected with the old one, and one-sixth of its capacity, or 333,333 gallons daily, are also lost. The total storage capacity of all the reservoirs is 5,866,160 gallons; but over 500,000 gallons of this could not be utilized at Burghmuir. The proposal was that they should erect within the existing stone walls at Burghmuir a reservoir on the same principle as the one built there in 1898, to hold 2,400,000 gallons. The estimated cost was £6264, and, in addition, £1636 would be required for the necessary piping from the water-works. In 1904 borrowing powers were obtained for this and other purposes, and at present they had borrowing powers to the amount of £10,500. The Water Committee recommended that these and other works, to cost about £15,000 should be carried out, so far as the money they have power to borrow will allow, and that an expenditure of £6200 upon the enlargement of Viewlands reservoir be delayed until some further borrowing powers are obtained in the next Provisional Order promoted by the Town Council. The Council have agreed to the proposals, and have decided that, in the next Order, borrowing powers to the extent of £10,000 shall be applied for, to enable them to extend the Viewlands reservoir.

CARRON

Gas Fires.

Distinguished by their unique and attractive designs.

The Material and workmanship are of the highest order.

Full Particulars on application to

Carron Company

INCORPORATED BY ROYAL CHARTER 1773

WORKS: CARRON, STIRLINGSHIRE.

SHOW-ROOMS:—LONDON (City)—15, Upper Thames Street, E.C.; (West End)—23, Princes Street, Cavendish Square, W.; LIVERPOOL—30, Red Cross Street; GLASGOW—125, Buchanan Street; MANCHESTER—24, Brazennose Street; BRISTOL—10, Victoria Street; NEWCASTLE-ON-TYNE—13, Prudhoe Street; BIRMINGHAM—218, 220, 222, Corporation Street; and DUBLIN—44, Grafton Street.

CARRON COMPANY · ESTD PERPETUA · FOUNDED 1759 · INCORPORATED BY ROYAL CHARTER 1773 ·

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Nov.* 9.

At the opening of the week there were considerable requirements to be covered, and full prices were readily obtained. Later, however, demand became less keen, and though there is not at any point any accumulation of stock (October shipments having been exceptionally heavy), prices at the close are the turn in favour of buyers. Probably the stringent financial situation to some extent accounts for this. The closing quotations are £11 18s. 9d. per ton f.o.b. Hull, £12 2s. 6d. to £12 3s. 9d. per ton f.o.b. Liverpool, and £12 5s. to £12 6s. 3d. per ton f.o.b. Leith. The forward position, too, is less sought after, and though £12 10s. per ton is still quoted by Scotch makers for spring months, it is probable £12 7s. 6d. per ton would be accepted at other shipping ports.

Nitrate of Soda.

This article is easier in all positions; and the closing spot prices are 11s. 1½d. to 11s. 3d. per cwt., according to quality.

Tar Products. LONDON, *Nov.* 11.

The markets are slack all round. Pitch is very quiet indeed for prompt delivery, and makers would accept low figures to secure prompt clearance. Buyers, however, appear to be fairly well supplied, and are not inclined to come into the market at present. Creosote is quiet, though there is still a fair demand for oil, and it is known that stocks are not at all heavy. Benzols and toluol are quiet, and there is little business doing. Solvents are slack, and makers are willing to accept reasonable prices for both prompt and forward delivery. Carbolic acid is steady; and for both prompt and forward delivery makers report that they are obtaining better figures than those put forward by Continental consumers. In anthracene, there is nothing doing. Creosote salts and naphthalene are both in good demand.

The average values during the week were: Tar, 14s. 9d. to 18s. 9d., *ex* works. Pitch, London, 24s. to 24s. 6d.; east coast, 23s. to 23s. 6d.; west coast, 22s. to 23s. 6d. Benzol, 90 per cent., 8⅜d. to 9d., casks included; 50-90 per cent., 8½d. to 9d., casks included. Toluol, 10d. to 10½d., casks included. Crude naphtha, 3⅞d. to 4d., naked; solvent naphtha, 11d. to 1s. 1d., casks included; heavy naphtha, 1s. 0½d. to 1s. 1½d., casks included. Creosote, London, 2¾d., naked; North, 2⅜d. to 2¾d., naked. Heavy oils, 3⅛d. to 3⅜d., naked. Carbolic acid, 60 per cent., 1s. 7¾d. to 1s. 8d., casks included. Naphthalene, £6 10s. to £10 10s., packages included; salts, 37s. 6d. to 42s. 6d., packages included. Anthracene, "A" quality, 1½d. to 1¾d., casks included.

Sulphate of Ammonia.

This article is steady without any great alteration in prices. The Gas Companies ask £12 7s. 6d. to £12 10s.; and it is reported that £12 2s. 6d. to £12 5s. is offered for second-hand stuff. Outside London makes are selling at about £12 on Beckton terms. In Hull, business has been done at £12 2s. 6d.; and in Liverpool, at £12 2s. 6d. to £13 9s. In Leith, the market is £12 5s. to £12 6s. 3d., and £12 7s. 6d. to £12 10s. for forward.

The Potteries Federation Scheme.

At a dinner given by the members of the Stoke-on-Trent Corporation to the Mayor (Mr. W. B. Hackney), Alderman Geen, in the course of some remarks on the Potteries federation scheme, denied that his financial proposals would prove detrimental to the legitimate interests of Hanley. He drew a clear distinction between new capital expenditure out of revenue and money spent out of revenue upon the replacement of plant. As a matter of fact, he said, in addition to the £16,000 of capital outlay out of revenue of the Stoke-on-Trent Gas-Works, which it was proposed should be repaid to Stoke, that borough had spent another £15,000 upon the undertaking which the Corporation did not ask to be repaid. He disputed the suggestion that the loans or the revenue expenditure that would fall upon the new borough, and which Hanley would have to assist in paying, would reach the estimates that had been put upon them. He contended that Hanley would make a good bargain, because the town would not only share in the profits that were made, after the differential period, but would be relieved of a proportion of its own liabilities. He ridiculed the suggestion that in twenty years' time the various gas-works would not be profit-making concerns. He said he would advise his Corporation to relieve Hanley of any charge with respect to the Stoke Gas-Works, if Stoke were permitted to keep the corresponding profits. He also suggested that before the end of the differential period Hanley might require a considerable new outlay for cemetery and other purposes. With regard to Hanley's suggestion to leave the financial questions to the Local Government Board, he pointed out that this proposal was a qualified one. Hanley did not wish to leave it entirely to the Local Government Board, but specified that there should be a fair valuation of assets, and that they should retain the income derived from the Exchequer from death duties, and so on. In a schedule of loans prepared by Hanley, it was stated that at the end of the differential period Stoke would be owing £60,000 in respect of loans. As a matter of fact, the sum would be £31,693, or, adding the interest which would also have to be paid, £42,781; and all of this was in respect of properties which would produce the whole of the necessary expenditure. Consequently there would be little, if any, call upon the rates in respect of the money owing by Stoke.

At the York Police Court, last Thursday week, Richard Lindow, a labourer, was sentenced to fourteen days' imprisonment for stealing 8s. 4d. from a penny-in-the-slot gas-meter belonging to the York United Gas Company. The principal evidence against the accused was furnished by his stepson, who saw the theft committed and gave information to the police and the Company. In passing sentence, the Magistrate (Mr. E. R. Dodsworth) warned the prisoner that if any harm befel the boy as the result of his action, the consequence would be serious. He would have police protection.

A HUGE SUCCESS *at Manchester Exhibition.*

THE **BLAND**

FACTORY LIGHT

Originally designed by Bland & Co.

GREAT ECONOMY
Effected in Lighting Factories and Workshops.

80 Candle Power Guaranteed

3 Cubic Feet per hour.

MANTLES UNAFFECTED BY VIBRATION.

Gas Regulating Nipple with Triangular Needle and Side Adjustment.

Anti-Back Lighter.

Steatite Nozzle.

PLEASE NOTE THIS.

From ALPHA WORKS, OLD KENT RD., LONDON, S.E., where they have replaced 177 Burners by 46 Bland Lights, the proprietor writes:—"We have found the upkeep most reasonable, and are getting a much better light."

BLAND & CO.

LONDON & MANCHESTER.

London Show-Rooms—
63, Queen Victoria Street, London, E.C.

Manchester Show-Rooms—
20, Fennel Street, Corporation Street.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The sudden settlement of the threatened railway strike has taken away from the minds of colliery proprietors, and perhaps not less from the general public, a feeling of anxiety and perturbation as to what might be the result of a general stoppage of railway traffic. No danger is now apprehended to the remarkable flow of national trade, which continues to show such extraordinary results. Coal exports are not the least important of the items which swell the enormous total of over thirty-three millions of exports. With foreign customers ever clamouring for coal from every shore, and with an expanding Home market, the continued success of the coal trade, so far as can be seen, is assured. Lancashire coalowners are at present full of orders for all kinds of coal and cannel. The demand for cannel latterly has exceeded ordinary requirements. One coal company in the Manchester district had to refuse an order for 4000 tons of this material within the past few days. Steam coal and boiler fuel are in constant request. The little falling off in household coal is of no moment. Coalowners cannot be tempted to reduce quotations. The shipping trade here keeps up well. Prices remain unaltered. The average quotations at the pits are as follows: Best house coal 15s. to 16s. 6d., secondary 14s. to 15s., common 12s. to 13s. 6d., burgy 10s. 6d. to 11s. 4d., best slack 9s. 6d. to 10s. 4d., medium 8s. 6d. to 9s., lower qualities 7s. 9d. to 8s. 4d., coal for shipping 13s. to 14s. 6d. f.o.b. at Garston, furnace coke 19s. to 25s.

Northern Coal Trade.

There has been a renewed demand for coal; and the prices have shown some firmness. In the steam coal trade, best Northumbrians are now about 15s. 1½d. to 15s. 4½d.—some of the collieries being well placed for orders for the rest of this month, and asking occasionally prices that are slightly higher. Second-class steams are 14s. to 14s. 6d. per ton, and steam smalls from 10s. to 10s. 6d.—all f.o.b. In the gas coal trade, the demand for supplies is now nearing its fullest, and on the long contracts very heavy shipments are being made. Durham gas coals are quoted from about 13s. up to 15s. per ton f.o.b., according to quality, with a slightly higher price for "Wear special" classes. Some of the second-class gas coal collieries are not quite so well off for orders—the transfer of trade to some of the Yorkshire pits having had some effect. The foreign shipments are, however, full at the present time. There are no new contracts of moment this week. Coke is weaker; and this affects the price of gas coke, more especially as the output is heavy. Good gas coke is quoted at from 19s. to 19s. 6d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

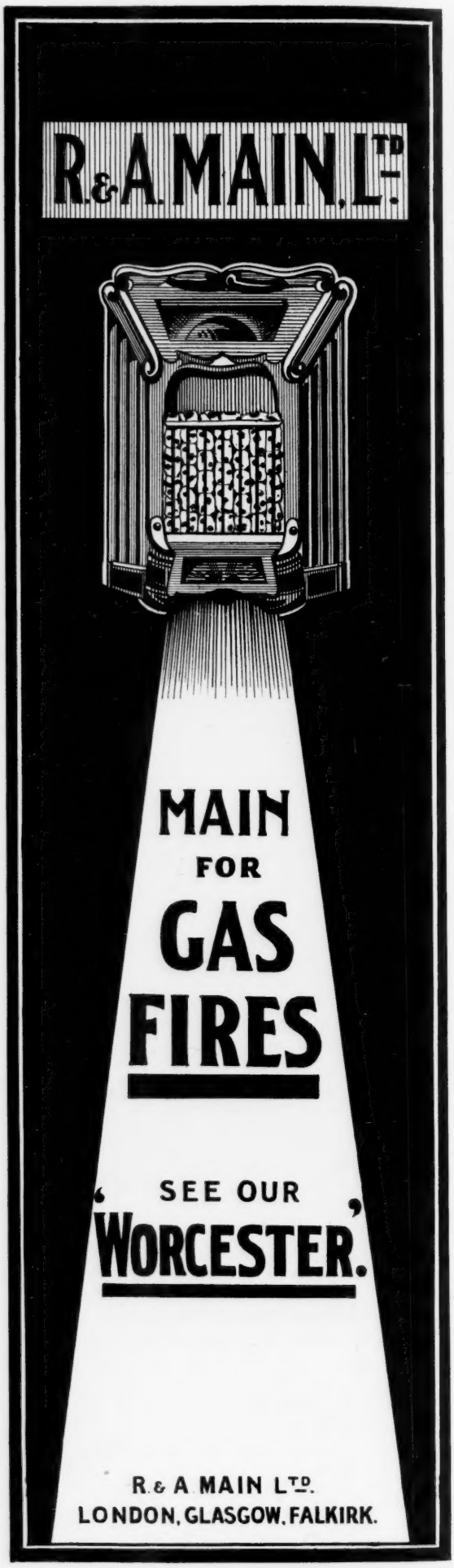
The market is quiet. Forward business is still the weakness, though there are a number of inquiries, which are tending to keep prices steady. There is a ready output, under contracts. Small stuff is more plentiful than it has been, and steam coal is in fair request. The prices quoted are: Ell 14s. to 16s. per ton f.o.b. Glasgow, splint 15s. to 15s. 6d., and steam 14s. to 14s. 3d. The shipments for the week amounted to 304,988 tons—an increase of 15,348 tons upon the preceding week, and of 11,018 tons upon the same week of last year. For the year to date, the total shipments have been 12,683,768 tons—an increase of 979,669 tons upon the corresponding period of 1906.

Dangers of Amateur Gas-Fitting.—The family of a printer at Cardiff were startled by a violent explosion of gas on their premises a few evenings since, which caused considerable damage to the house and adjoining property. A gas-bracket had been removed from the kitchen to another room, and the member of the family (apparently not a gas-fitter) who did it thought he had properly plugged the hole. This, however, he could not have done, as there was a great escape of gas, which was fired by a bicycle lamp carried by his brother, who was seriously shaken by the force of the explosion, and was also burnt on the face, neck, and hands.

Exmouth Water Supply.—Further correspondence has passed between the Exmouth Urban District Council and Messrs. Hill and Sons, of Manchester, respecting the proposal that Mr. G. H. Hill should visit Exmouth and advise the Council on the subject of an addition to the water supply. Mr. Hill informed the Council that it was difficult to say what steps would be required, but gave them a statement respecting his charges for attendance. It was decided that Mr. Hill should be asked to come down and advise the Committee, and that during his visit he should meet the whole of the members of the Council in committee.

No Increase of Price at Teignmouth.—A very satisfactory report on the working of the gas undertaking for the past six months was presented to the Teignmouth Urban District Council last week. Mr. J. A. Gray, the Gas Manager, stated that at the close of the six months, on Sept. 30, the financial position was £167 better than at the corresponding period of last year; and though it was estimated that the cost of coal for the present half year would be £375 more than last year, he anticipated that the undertaking would show a net profit of £360 for the twelve months. In view of this satisfactory report, the Council decided not to increase the price of gas.

Well-Water Preferred at Diss.—At a recent meeting of the Diss Urban District Council, a letter was read from Messrs. Baker and Co., of Parliament Street, Westminster, asking if the Council would consider an application for permission to lay mains in the public roads in the district for the purpose of giving a water supply. Their clients, they said, were forming a company with this object, and were prepared to carry out the work forthwith, if the necessary authority was given. The Chairman (Mr. R. A. Bryant) mentioned that members of the firm were in the town, and were prepared to have an interview with the Council if desired. Some members held that a public water supply should be in the hands of the town, and not in those of a private company; while others considered the present supply from wells met all requirements. Not a single member expressed himself in favour of placing the matter in the hands of a company. It was unanimously agreed to decline the offer.



New Joint-Stock Companies.

The Parkinson Stove Company, Limited, has been formed, with a capital of £50,000, in £1 shares, to acquire the business of manufacturers of gas-stoves, forming part of the business carried on in Birmingham and elsewhere by Parkinson and W. & B. Cowan, Limited, and to adopt an agreement between the Company of the first part, W. C. Parkinson and J. A. Patullo of the second part, and J. H. Rice (for the new Company) of the third part. There will be no initial public issue. The first Directors, of whom there are to be not less than three nor more than nine, are Messrs. W. Cowan (Chairman), J. Hepworth, W. C. Parkinson, W. H. Cowan, J. L. Cloudsley, F. R. Smith, W. Cheshire, and W. W. Parkinson. The qualification (except for Managing-Director) is 1000 shares. It is provided, however, that while the vendor Company or their nominees hold 15,000 shares, any Director of that Company shall be eligible as a Director of the new Company without further qualification, and that while the vendor Company hold half the issued capital, the Directors (except the Managing-Director) shall be the Directors for the time being of the vendor Company. The Stowmarket Gaslight and Coke Company, Limited, has been registered, with a capital of £10,000, in £1 shares (4000 preference), to take over the business of the Stowmarket Gas and Coke Company, carried on at Stowmarket and Stowupland, Suffolk, and to adopt an agreement. There will be no initial public issue.

Lighting of Scalby by Incandescent Gas.

The village of Scalby, near Scarborough, was lighted by gas for the first time on the 1st inst. The scheme has given rise to some objections; but now that it has been successfully carried out, it is believed that it will meet with general approval. There are fourteen lamps—eleven of them being at Scalby and three at Newby—all on the incandescent system, similar to those in use at Scarborough. They are each of about 120-candle power, and have been placed in the best possible positions. The supporters of the scheme limited themselves to a rate of 1d. in the pound; and it is considered that they have done a very satisfactory piece of work with the amount at their command. The first lamp, situated at the Temperance Hall, was lit by Mr. W. T. Brown, the Chairman of the Urban District Council, who has for some years been a strong supporter of the lighting scheme. Mr. Hill, a member of the Council, expressed his pleasure that the lighting of the village had at last been accomplished, and referred to the liberal support accorded to the Council by the Scarborough Gas Company, by whom the work had been carried out. Mr. A. Allan, the Company's Engineer and Manager, in responding to a vote of thanks, said they had tried to give Scalby everything up to date; and so far they had met with the appreciation of the public. The assembled company then made a tour of the village, and lighted the rest of the lamps.

The Lighting of Portadown—Electricity Suggested.

As a result of the failure of the gas supply at Portadown, which was referred to in the "JOURNAL" for Oct. 29 (p. 370), Mr. H. V. Pegg, Consulting Engineer to the Belfast and North-East of Ireland Power Gas Company, lately waited on the Town Council, and put before them details of a scheme for lighting the town with electricity. He said his Company meant business, and had decided to erect the first station in Ireland in Portadown or the neighbourhood, at a cost of between £60,000 and £100,000; and from this station they would supply other towns. There were some financial details yet to be arranged; but the station would be completed within ten months from the commencement of the work. He suggested that the Council should consider the advisability of adopting a scheme for lighting the town by electricity, and should apply for a Provisional Order for this purpose. The Chairman said this was a matter of vital importance to the town; and he assured Mr. Pegg the Council would sympathetically consider what he had put before them. But he pointed out that it would be unwise for any public body to rush a matter of this kind through at so short notice. If the Company proceeded with the work, they would encourage the Council in what they might do later on. Mr. Pegg said his Company had decided to proceed with the work, and to erect the first station in the Portadown district. This was entirely irrespective of what the Council might do in the matter; and his reason for appearing before them was that he had read reports in the newspapers regarding the trouble they had recently had in reference to the lighting of the town. It was resolved that the whole Council be appointed a Committee to consider the improved lighting of the town, and that they be empowered to expend a sum of £50 in procuring professional information and advice on the subject.

Haslemere Water Supply.—A new supply of water has been provided for Haslemere, Surrey, at a cost of £12,000; and the opening ceremony was performed by Mrs. Chandler, the wife of the Chairman of the Parish Council. Mr. R. F. Grantham, M.Inst.C.E., was the Engineer. The works were in course of erection for two years. The reservoir is capable of holding 112,000 gallons, and the available daily supply is 57,000 gallons, which is expected to be sufficient for many years. Gas-engines are employed for pumping the water.

Progress at the Devonport Gas-Works.—In spite of the fact that the Devonport Corporation Gas-Works have practically lost the largest consumer by the adoption of electricity for lighting and power purposes at the Government Dockyard, the consumption of gas continues to increase. At the last meeting of the Gas Committee, the Gas Engineer and Manager (Mr. J. W. Buckley) reported that in September the output of gas showed an increase of 6·57 per cent. A Sub-Committee who had considered the question of the price of gas in view of the advance in the cost of coal, recommended that no increase should be made in the charge. The Committee endorsed the view of the Sub-Committee; and the price will therefore remain unchanged.

GODIN'S STOVES

4000 Patterns.

BURNING COKE

Annual Output 200,000 Stoves.

A Consulting Engineer writes:—

"GODIN'S COKE STOVES deserve the attention of Gas Companies, especially during the present high price of household coal, and good COKE STOVES ought to be in the Show-Room of all Gas Companies."

The Improved Coke-Stove.

Telegrams: "AMOUR, LONDON."
Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

A. G. CLOAKE,

54, HOLBORN VIADUCT, LONDON, E.C.

More New Issues of Capital.—By an announcement which appears elsewhere, our readers may see that Mr. Alfred Richards will offer for sale, at the Mart, Tokenhouse Yard, E.C., next Tuesday, by order of the Directors, a new issue of 600 additional ordinary £10 shares in the Lowestoft Water and Gas Company, and 500 "B" shares in the Grays and Tilbury Gas Company. The former capital ranks for a maximum dividend of 7 per cent., and 5¾ per cent. is now being paid; while the latter ranks for a standard dividend of the first-named amount, but will carry £5 12s. per cent. per annum as from Dec. 1.

Public Lighting of East Cowes.—At a recent meeting of the East Cowes Urban District Council, a new tender by the East Cowes Gas Company for public lighting for five years was accepted. The Electric Light and Power Company wrote that, owing to the very unsatisfactory condition of the Money Market, the Directors regretted not being able to tender now for lighting the rest of the town. Five years ago the Council accepted the Gas Company's tender, though the Electric Light Company's price was 2s. per lamp less. There are only five electric lamps in use, which were put up five years ago as an experiment; but they do not appear to have given satisfaction.

Castle Donington Public Lighting.—The public lighting question at Castle Donington has entered on a new phase owing to the purchase of the local Company's undertaking by the Draycott Gas Company, who have communicated to the Parish Council the statement that, while very little can be done at present to improve the actual lighting of the town, a rebate of 20 per cent. will be allowed on the charge for gas, thus reducing the price to 3s. 4d. per 1000 cubic feet. Subject to the sanction by Parliament of the transfer of the Castle Donington Gas Company to the Draycott Gas Company, the latter undertake to provide the town next season with a superior light at a smaller cost than is entailed by the existing arrangement. The Company asked the Parish Council to support them in getting the transfer through Parliament; and the Council unanimously agreed to accede to the request.

Traction-Engines and Gas-Mains.—About noon last Thursday, some neighbours of Thomas Kerton, living at Chepstow, noticed that none of the family had been seen, and became alarmed. On the house being opened, the man, his wife, and eight children were found in an unconscious state in two small rooms upstairs. They were promptly carried into the open air, and, by the aid of restoratives, gradually brought round and sent for after-care to the Workhouse. It appears that a traction-engine had been hauling timber from the slip at the river bank, and that the weight broke a gas-main, and the gas made its way into the house by a sewer. In the course of the afternoon, the roads were opened, and the gas-mains were found broken in two places. The nearest break was about 10 feet from Kerton's house; the broken pipe being against the brickwork of a sewer manhole, from which there is a short drain to a culvert right against the corner of the house, the stonework of which is old. The gas was traced into the house from this corner.

Pollution of Rivers.—In answer to an influential deputation from the British Science Guild which waited upon the President of the Local Government Board on the 31st ult., and urged that the whole of a river area should be under one controlling body, and that there should be a central authority under Government which could be a kind of court of appeal between conflicting interests, Mr. Burns said that he hoped next session to bring in a Bill dealing with some of the points which had been brought forward. The subject had been long under discussion in the Local Government Board, which he thought should be the central and final authority in the matter. The Board, indeed, should act more and more as a real National Board of Health, dealing with all questions which affected the general health of the people, such as water supply, &c. The Bill which he hoped to introduce would require all the support which could be brought to bear on it; he therefore hoped that the members of the guild would use every means in their power to influence public opinion, and educate it up to the required point before April or May next.

Further Increase in Railway Coal Rates.—The "Iron and Coal Trades Review" last Friday made the following announcement: "Once again the Railway Companies are turning their attention to the coal trade as a means of raising additional revenue. Not content with the enforcement of siding rent, the more recent 20-cwt. ton pronouncement, and other delicate attentions of a like character, they now have designs upon the 15 per cent. rebate at present allowed off the rates on smudge or small coal, the price of which at the pit does not exceed 2s. per ton. The altered rates are not to come into force until the 1st of January; and before that date we have no doubt that both the trade and the buyers interested will have something to say on the subject, since the withdrawal of an allowance of 15 per cent. on the class of fuel in question is a serious matter to all concerned. It means that the companies will now charge at least 5s. 3d. per ton—which is about the lowest rate—to bring to London fuel worth 2s. per ton, or less; whereas they formerly charged about 4s. 6d. The difference is about 9½d. per ton, which is a very real and substantial increase. An advance in railway rates is also announced from the North of England, which, though less in amount, affects a far greater tonnage."

Lighting and Heating of Windsor Workhouse.—The Windsor Board of Guardians have had, at various times, a considerable amount of discussion over the question of the lighting, heating, and provision of motive power for their workhouse, which, by the way, stands in somewhat of an isolated position as far as its proximity to gas and electric mains is concerned. Now, after having gone at a great length into the comparative merits of gas, electric, oil, and acetylene lighting—the adoption of each system being supported by some or other of the guardians—they are calling in an expert engineer to advise and help them out of their difficulties. The heating of the house is costing at the present time between £600 and £700 a year, the water bill runs into £300 for the same period, and the oil-lamps in use cost the board on an average £145 per annum. In the "terms of reference" to be submitted to the expert, his opinion is asked upon the best and most economical means of lighting and heating the workhouse and of supplying an institution of this character with water and motive power. The guardians hope, by paying an engineer's fee, to get advice which, when followed, will effect a great saving to them annually.

S&P

SAWER & PURVES

PREPAYMENT METERS.

WET AND DRY.

MANCHESTER & NOTTINGHAM.

M&N

Flat-Flame or Incandescent Burners at Portrush.—The Portrush Urban District Council having invited tenders for a "thorough and complete lighting installation for the town by means either of electricity or gas," one offer only was received—from the Gas Company; and this was, for flat-flame burners £379 10s., and for incandescent burners £255 17s. 6d. The decision was, however, not so easy as might have been thought, inasmuch as one member reminded the Council that there was a resolution on the books to the effect that they were only to have flat-flame burners; and the only class of burner mentioned in the specification was the flat-flame burner. He did not, therefore, see how they could legally accept a tender for incandescent burners. It was agreed that gas lighting should be adopted, and that the class of burner be determined at the next meeting of the Council.

Reservoir Leakages at Halifax.—As the result of testing by being filled with water, some small leakages have been discovered in all the new reservoirs constructed by the Halifax Corporation at Walshaw Dean. The Water Committee have asked Messrs. George H. Hill and Son, the Engineers, to advise them as to what means should be adopted to remedy the defects. It is stated that the water falls round the corner of the embankments, and that the main embankments are not defective. The leakages are not at present regarded as serious. The reservoirs have already entailed an expenditure of about £350,000 (double the original estimate); and it is hoped that the leakages will be remedied without much addition to this heavy cost. The chief cause of the increased expenditure was the digging of the trenches to a much greater depth than was originally considered necessary.

Explosion in an Electric Light Manhole at Swansea.—Users of electric light at Swansea had last Thursday evening a very exciting experience, when at about half-past seven an explosion occurred in a manhole in the Strand. The heavy cover was thrown into the air, and a great volume of flame shot up, and lasted for nine minutes—its height varying from 10 to 50 feet. The locality was not far from the electric light station; and as soon as the occurrence was reported there, the current was cut off and the flame extinguished. The effects of the explosion were felt in every part of the town. First the lights went out, then returned with extraordinary brilliancy, and afterwards were again extinguished; and almost everywhere fuses were blown out. For some nine minutes the streets lighted by electricity were in darkness, and so were the places of amusement, the Post Office, most of the hotels, and every public place. Where gas has been retained, it was, of course, quickly brought into use; and where this could not be done, candles were resorted to.

Taxing Gas Consumers for Public Improvements.—One of the Elective Auditors for Liverpool (Mr. George Barker) is suggesting that, in order to escape the payment of interest and commissions on capital raised for unremunerative enterprises, such as public improvements, these latter desirable objects should be financed by the profits of trading undertakings. "Municipalize the gas supply and make a profit of £50,000 out of it," he says in effect, "and carry out a £50,000 street improvement with the money." Our contemporary the "Municipal Journal," comments upon this proposal as follows: "We have never been able to understand why Liverpool has not acquired control over its gas supply; but we hope it will never do anything so unsound and unjust as to make gas consumers pay the cost of large public schemes that ought to be borne by the city as a whole. The effect of such a policy would be disastrous. Instead of trading undertakings being run at the lowest possible cost to the public, there would be a tendency to increase charges in order that they might be made to produce profits sufficient for the carrying out of schemes which in the ordinary way would involve large borrowings. By this course indirect taxation would be levied on sections of the citizens who would be forced to pay rates from which large numbers of ratepayers would be exempt. A rate is still a rate, whether it is levied in gas charges or by so much in the pound on rateable value."

The Parish Council of Garforth have made representations to the Leeds Water-Works Committee as to the desirability of arrangements being come to in the near future whereby Garforth should be supplied with Leeds water.

On Monday last week, Mr. P. W. Rumble took possession, on behalf of the debenture-holders, of the property and assets of Messrs. Anderson and Duffield, Limited, of Farringdon Street, manufacturers of, and dealers in, gas-lamps, fittings, &c.

It is stated that excellent results are being obtained at West Cowes from the newly-installed coal "traveller" at the Corporation Gas-Works; and according to a report furnished to the Town Council, that body has been informed that the unloading expenses have been materially economized.

The Water Committee of the Liverpool Corporation have established a club or institute at Vyrnwy for the benefit of the water-works employees. It was opened by Mr. Joseph Parry, M.Inst.C.E., the City Water Engineer, and is provided with games, books, and a piano. It is to be managed by the employees.

The Municipality of Montreal are inviting tenders for the supply of gas and electricity for lighting and other purposes in the city from the expiration of the contracts now in force. The tenders are to be made separately, and that for gas is to state the price per 1000 cubic feet. Each tender is to be accompanied by a cheque for $50,000, which will be retained by the authorities until the contract has been signed. Tenders are to be sent in before noon on the 16th prox. to the Clerk (Mr. L. O. David) at the City Hall.

On Monday night last week, Sir Melvill Beachcroft, the Chairman of the Metropolitan Water Board, delivered a very interesting address at the Finsbury Town Hall on "The Water Supply of London," which, he said, was becoming a most anxious question. The Board had now 6000 miles of mains, and supplied a population of 6¾ millions, consuming on an average 220 million gallons of water per day. Glasgow, the next largest city in point of population, had only one-sixth of the number of people to supply.

PARKINSON'S

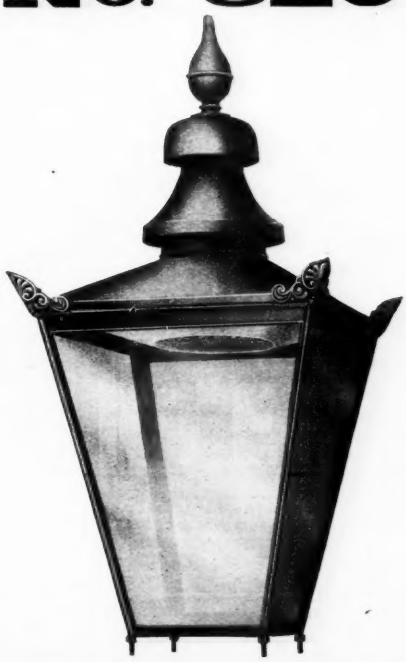
The "OPAL."

GAS-FIRE

With Gas and Air Adjuster.

Single Row Fuel, Registered Design.

No. 820



LANTERN.

WRITE—

PARKINSON AND W. & B. COWAN, LTD.

(PARKINSON BRANCH),

COTTAGE LANE, CITY ROAD, LONDON. | BELL BARN ROAD, BIRMINGHAM.

LEAFLETS FOR DISTRIBUTION.

"ILLUMINATING TRUTHS FOR HOUSEHOLDERS."

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.
Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
CONTROL OF GAS LIGHTING, COOKING, AND METER INSTALLATIONS. No. 4866.
DRAUGHTSMAN. W. C. Holmes & Co., Huddersfield.
CANVASSER. No. 4857.
ERECTION OF ACETYLENE INSTALLATIONS. No. 4860.
WORKS FITTER. No. 4864.

Situation Wanted.
WORKING MANAGER, &c. J. Smith, Alford.

Plant (Second-Hand) for Sale.
BOILER. Redditch Gas-Works.
CARBURETTING APPARATUS. Division Officer, R.E., Shorncliffe Camp.
EXPERIMENTAL GAS PLANT (WHOLE OR PART). Manchester Gas Department. Tenders by Nov. 21.

Plant (Second-Hand) Wanted.
STATION METER. No. 4865.

Stocks and Shares.
BARNET GAS AND WATER COMPANY. Nov. 20.
COUNTY OF LONDON ELECTRIC SUPPLY COMPANY. Nov. 20.
GASLIGHT AND COKE COMPANY. Nov. 20.
GRAYS AND TILBURY GAS COMPANY. Nov. 19.
HARROW AND STANMORE GAS COMPANY. Nov. 21.
KINGSTON GAS COMPANY. Nov. 14.
LOWESTOFT WATER AND GAS COMPANY. Nov. 19.
REDHILL GAS COMPANY. Nov. 20.
SOUTHEND WATER COMPANY. Nov. 26.
SOUTHGATE GAS COMPANY. Nov. 20.
WALKER AND WALLSEND GAS COMPANY. Dec. 2.

TENDERS FOR

Gasholder and Steel Tank.
AARHUS BELYSNINGSVÆSEN, Denmark. Tenders by Nov. 30.

Lead (Pig).
PLYMOUTH WATER DEPARTMENT. Tenders by Nov. 21.

Oil for Gas Making.
PONTYPRIDD GAS DEPARTMENT. Tenders by Nov. 18.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON,
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BENZOL
AND
CARBURINE FOR GAS ENRICHING.

ALSO
THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."